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THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOL. 18 NO. 1 JAN. 5, 1999

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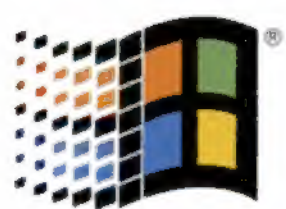
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WINDOWS[®] 20

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The Year Past, the Year Ahead

Traditionally, this is the time of year to look back at the year past and forward to the year ahead. At PC Magazine Labs in 1998, we tested more than 2,000 products and services. Of these, 130 earned special mention as our Editors' Choice products, those we thought were tops in their specific categories.

1998 was a good year for the computer industry, not a great one. Our 1998 Editors' Choice winners reflect a year of change, which leads 1999 to be a year of improvement and expansion.

Perhaps the biggest change in the products we evaluated in 1998 was the emergence of all sorts of new Internet-based services. Over the past several years, we've seen early Internet services evolve into businesses such as Yahoo! and Amazon.com. In 1998, it seemed as if almost every business was either on the Net or preparing to go there.

We saw all sorts of new places to shop electronically. Web sites that sell books and music aren't new, but they have really improved in the past year. And we've seen a lot of new places to buy everything from computer equipment and clothing to flowers and groceries.

We've seen search engines blossom into portals, offering services such as home pages, e-mail, weather, community sites, and local entertainment guides. We've seen lots of Web sites that offer investment information and services, typically at prices that vastly undercut the traditional stock dealers. Some sites offer Internet-based accounting, payroll, or outsourcing of IT functions. And this will only grow in 1999.

Three years ago, none of these Internet-based services existed. We reviewed more than 300 in 1998, and next year, we hope to review two or three times that number.

Personally, I'm finding myself spending a fair amount of Internet time at PC Magazine Online, ZDNet, Yahoo!, Excite, and Amazon. My guess is you have your own favorites; one of the great things about the medium is that it offers so many choices.

Meanwhile, as usual, we saw a number of improvements in the computer hardware we use to access the Internet and for other tasks. Moore's Law, which states that chip complexity and thus performance doubles every 18 months, is still in full force,

as seen by desktop computers with processors running at up to 450 MHz. Just 18 months ago, the 233-MHz Pentium MMX processor was brand-new.

We expect to see new processors such as Intel's new Katmai and AMD's new K7 chip, along with a number of new processors aimed at less expensive machines and portable computers. We need machines that are not only faster but simply better—easier to set up and maintain, and more reliable.

The average price for a desktop computer continued to fall in 1998. Right now, you can find quite a good machine for around \$1,000 and a great machine for \$2,000.

In 1998, notebooks improved at an even more rapid pace than desktops. This year's crop is faster and smaller and offers far better screens—even though prices there are dropping rapidly too. As with desktops, we expect notebooks to continue to improve dramatically in the year ahead.

We saw similar innovation in peripherals, with inexpensive color printers that can match the quality of traditional film processing, plus massive improvements in digital cameras and scanners. We're beginning to see the emergence of great flat-panel displays at prices not much higher than conventional monitors cost a few years ago.

There weren't many huge releases in desktop software this year. We saw only relatively minor improvements and integration in Corel WordPerfect and Lotus SmartSuite; and both Netscape Communicator and Microsoft Internet Explorer got only incremental releases this year, compared with the major improvements in past years. We did see advances in voice recognition and end-user graphics, as well as unique products like Play Inc.'s Gizmos and Dan Bricklin's Trellex 2.0.

So in many ways, 1998 saw lots of good new products and great new prices. 1999 promises even more in both areas. And I'm sure the biggest breakthroughs are still to come. **PC**

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can find quite a
good machine
for around
\$1,000 and a
great machine
for \$2,000.**



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questions every Tuesday,
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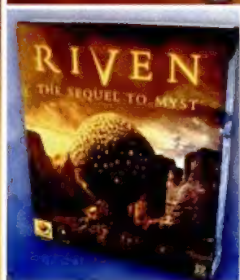
COVER STORY

The Best Products Of 1998

BY THE EDITORS OF PC MAGAZINE

Never mind all the lawsuits and controversies and ups and downs in the stock market. In the face of all that, our industry moves ever forward. This year yielded another fine crop of products, and we're back again with our annual roundup, recognizing the crème de la crème, the products that merit a special tip of the hat100

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SPECIAL PULLOUT SECTION

1998 Editors' Choice Gallery

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NETWORKING

Network PBXs Come of Age

BY DON LABRIOLA

These digital telephone systems built on NT boxes will appeal to many small offices. Proof again how nicely standards can open up a market—plus, the designers make good use of the familiar Windows interface. Warning: You need both data networking and telecommunications skills to set up these devices, so vendors sell them only through VARs201

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INTERNET

Set Up Shop Online

BY JAY MUNRO AND DAVID LIDSKY

Your biggest decision is already made when you hang out your online shingle in the first place. After that, find the storefront software package that works best with the kinds of systems you're already running and the kind of expertise you've got in house155

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Does the thought of no partitions terrify you?

(No wonder your computer keeps freezing up.)



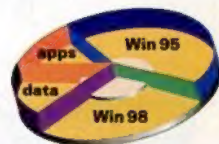
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Voice Printing



Slowly but surely, speech recognition is finding a meaningful life in applications beyond dictation. One of those is *speaker recognition*, in which a computer identifies your unique *voice print*. A voice print can control access to your PC or call up your personal profile when you pop into a Web store to pick up a few things.

For instance, a Web site with speaker recognition would know from your voice that you're a size 10 and like the color red. It's one ID card you'll never lose, unless, of course, you have laryngitis.

Since the 1950s, IBM researchers have been laboring to get computers to understand the human voice. Stephane Maes, a researcher in the Human Language Technologies group at IBM's Thomas J. Watson Re-

search Center, recently demonstrated one of the fruits of this work. IBM's VoicePrint is a technology that can identify a speaker based on any words spoken in any language. Since it's text-independent, it doesn't need to know in advance what you'll say.

During enrollment, the software models the vocal-tract geometry between the glottis and mouth and figures out the resonance associated with the throat cavity. The system works by matching vocal characteristics, not words.

Still, voice ID isn't as fool-proof as the handy fingerprint. According to Maes, "Speaker recognition, like biometrics in general, is still an emerging technology with a significant amount of unknown and poorly understood factors."

Mobile, Wireless, Always

Accessing your corporate data and e-mail wirelessly may get a whole lot easier this year. Microsoft and Qualcomm recently announced that they're forming a jointly owned company, WirelessKnowledge, to deliver wireless Internet and corporate network access to hand-helds, desktops, notebooks, phones, and pagers. Initially, WirelessKnowledge will offer e-mail, contact list and calendar management, information services via the Internet, and access to Microsoft Exchange-based corporate networks. It will sell services to carriers, including Airtouch Communications, AT&T Wireless Services, Bell Atlantic, BellSouth, GTE, Leap Wireless, Sprint PCS, and US West Wireless.



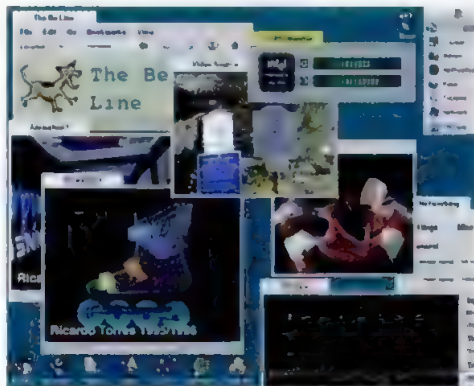
ILLUSTRATION BY CHRISTOPHER HITE

570%

of respondents to a recent PC Magazine Online poll told us they'd be willing to pay no more than \$19.95 a month for cable modem access at home. 34 percent said they would pay \$39.95, but only 5 percent said they would pay \$59.95 or more. 4 percent said they wouldn't want cable modem access at any price.

Be Goes Beyond

Be Inc. recently debuted all sorts of changes to the Be operating system. Release 4.0 is designed to appeal to a wider audience than just the applications developers who have been the OS's only users up till now. To broaden Be's horizons, the company has decided that the OS needs to support more standards, offer more hardware, and attract more developers of productivity applications. Release 4.0,



BROADER HORIZONS: Release 4.0 of Be's operating system is designed to handle advanced multimedia and support more standards.

priced at \$70 (list), will support advanced printers, SCSI devices, and more video file formats, including AVI.

According to the company's chairman and CEO, Jean-Louis Gassée, "We have found that in the Intel space users are very open to multiple operating systems. On Intel platforms, there's a long-standing feature called the boot manager, so many people are used to booting more than one OS." You can dual-boot Be with Microsoft Windows if you want to run both concurrently. Gassée stresses that the success of Linux has shown that alternative operating systems can still attract users.

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Best of the Year: What's Your Favorite?

This issue highlights our choices for the best products of 1998, but we know you have opinions, too. Join us online.

New Online Annual Index

Try out PC Magazine Online's searchable, linked index of every product we evaluated in 1998.

John C. Dvorak: Every Monday

Check in with our cantankerous columnist for his news, views, and snide asides.

The Top 100 Web Sites

We've selected five sites in each of 20 categories that reflect the Web's ever-expanding scope.

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Unix: More Flavors Ahead

Use of Unix-based servers has been steadily increasing over the past two years, according to market research firm Dataquest, thanks to open-source software and multiple flavors of Unix.

In the latest news, IBM is teaming up with Santa Cruz Operation (SCO) and Sequent Computer Systems to develop a new version of Unix, code-named Monterey, for Intel's IA-64 chip. The software is based on IBM's current Unix offering, AIX, and will run on PowerPC chip-based RS/6000 servers. Analysts say the IBM deal could have big repercussions in the market, especially for AIX, a long-standing Unix player.

Taking a cue from Linux—the free, alternative version of Unix—Sun Microsystems is giving away its newest 64-bit software (not the source code), Solaris 7, to those using it for noncommercial purposes.

Meanwhile, Sun plans to port its Java Development Kit 1.2 to Linux. The move will enable any Java application to run on Linux, which now has over 7 million users.



Palm, Part II

The Palm operating system—which runs on the hugely successful 3Com PalmPilot and Palm III line of handheld computers—has seen its horizons expanded recently as thousands of software developers have been producing new applications for it. Now Jeff Hawkins, the father of the Palm platform, has left his post at 3Com to form a new company called Handspring, dedicated to developing new consumer products that use the Palm OS.

There's no word yet on what the products will look like, but the first ones are expected by the beginning of 1999. Handspring has received venture-capital funding from Silicon Valley heavyweights Kleiner, Perkins, Caufield & Byers. According to Kleiner, Perkins partner John Doerr, "We missed the opportunity last time when Jeff Hawkins and his team sparked the hand-

held computing revolution, and this is a rare second chance."

According to Janice Roberts, 3Com's senior vice president of business development, "The Palm platform has become the standard in the hand-held industry, and we want to license it strategically to influential players such as Handspring." Handspring devices will use the Palm OS, so they'll be compatible with the many new apps developed for the PalmPilot.

HANDSPRING INC.: Palm father Jeff Hawkins is planning new hand-helds.



THIS ISSUE'S CONTRIBUTORS: Angela Hickman, Carol Levin, Sebastian Rupley, Don Willmont.



Global Paging For a Price

Need to send an urgent page from Palikir, Micronesia, to Manalapan, New Jersey? Now you can, if you're willing to pony up for it. The Iridium global satellite service, launched on November 1, will dispatch your page or wireless phone call anywhere in the world.

The equipment you'll need, though, will practically fill your briefcase (and empty your wallet). A complete package—including phone, removable cellular cards, snap-on satellite antenna, and power converters—costs about \$3,000; the pager alone runs about \$500. The paging service costs \$100 a month; satellite service, \$50 a month plus \$1.35 a minute; cellular roaming, \$50 a month plus 35 cents a minute.

The \$5 billion system also connects the world's cellular networks and offers a cellular roaming service accessible by new satellite/cellular phones from Kyocera and Motorola, which use plug-in radio cards for local cellular systems.

Top-Selling Retail Software

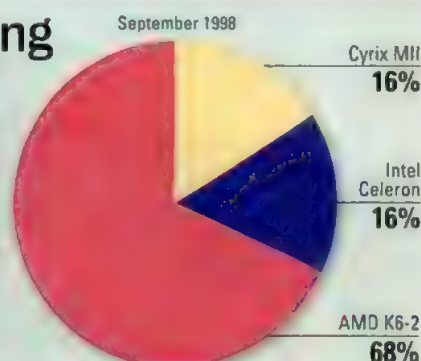
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 - 2 Norton AntiVirus 5.0 Symantec
 - 3 Microsoft Plus! 98 Microsoft
 - 4 Dr. Solomon's Anti-Virus Network Associates
 - 5 Microsoft Office Pro 97 Microsoft
 - 6 pcAnywhere 32 Symantec
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 - 8 Norton Utilities 3.0 Symantec
 - 9 Norton AntiVirus 4.0 Symantec
 - 10 Microsoft Windows 95 Upgrade Microsoft
- Source: PC Data, data for September.

Desktop Fiber

Most companies in the U.S. haven't yet upgraded their Internet connections to 1.5-megabit T1 lines, but that's not stopping developers from coming up with faster connections that could leave T1 in the dust. Newcomer SilkRoad has come up with a technique it claims can transmit data at around 75 gigabits per second. By transmitting coherently modulated data on a single wavelength, SilkRoad can significantly reduce the complexity of the signal and increase its speed. The result could enable applications for instant medical imaging and high-quality videoconferencing. Look for LAN products in late 1999.

AMD Rising

In September 1998, 49 percent of all desktop PCs sold through retail cost less than \$1,000, up from 27 percent a year earlier. The AMD K6-2 processor led this market with a 68 percent share, followed by the Cyrix MII and Intel Celeron at around 16 percent each.



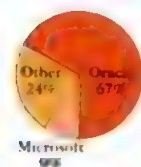
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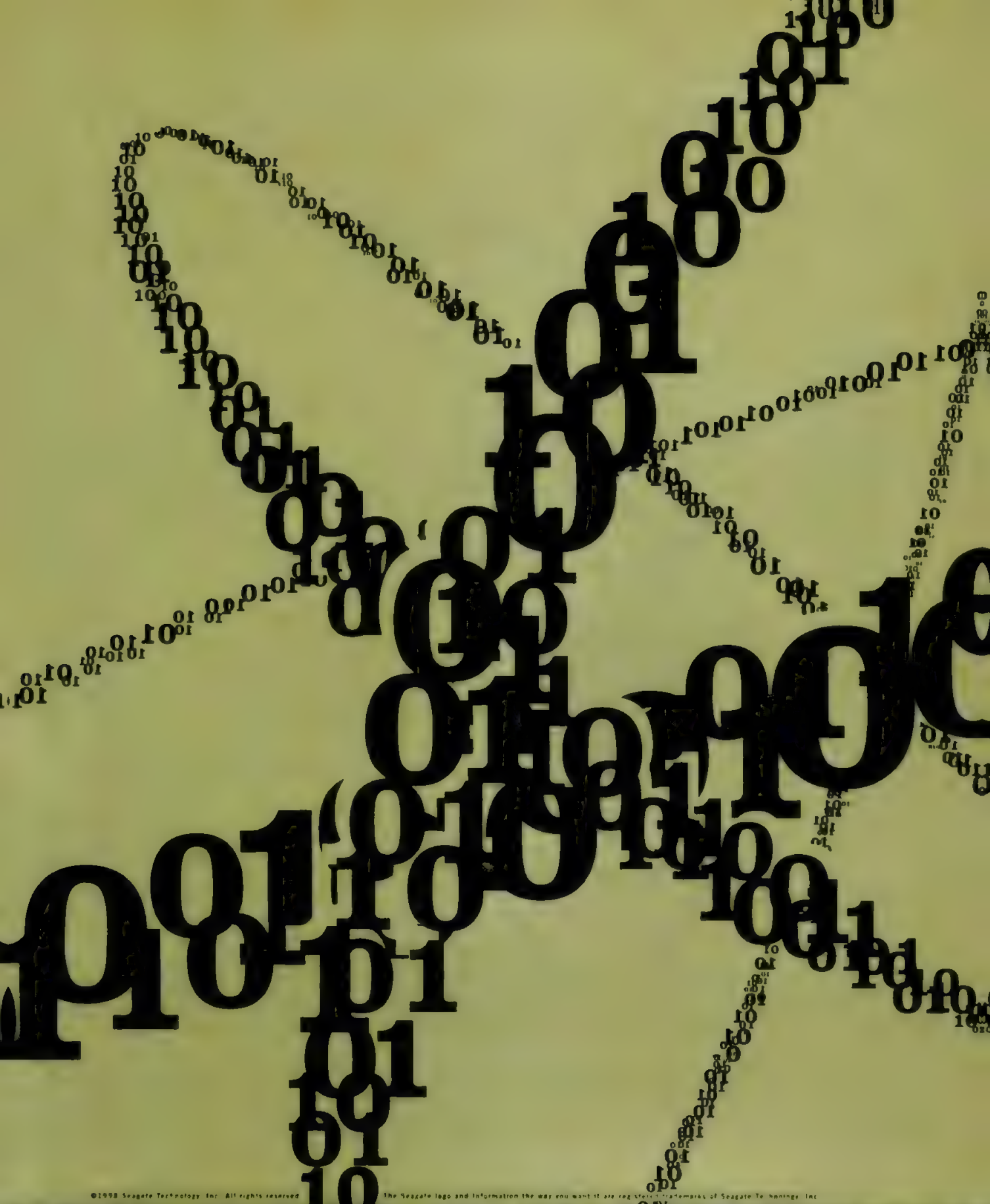


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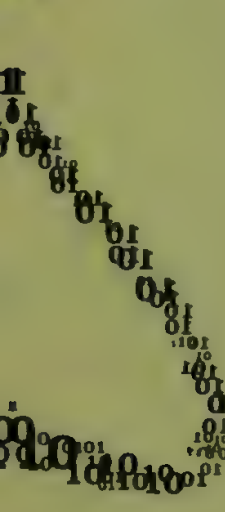
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A large, stylized graphic of binary code (0s and 1s) that curves across the top half of the page, resembling a large, abstract letter 'C' or a protective shield.

**WOULD IT or WOULD IT NOT
be nice to have central control of all your data?**

WITH STORAGE NETWORKING, YOU WILL.

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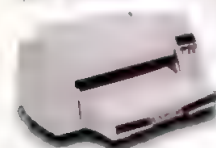
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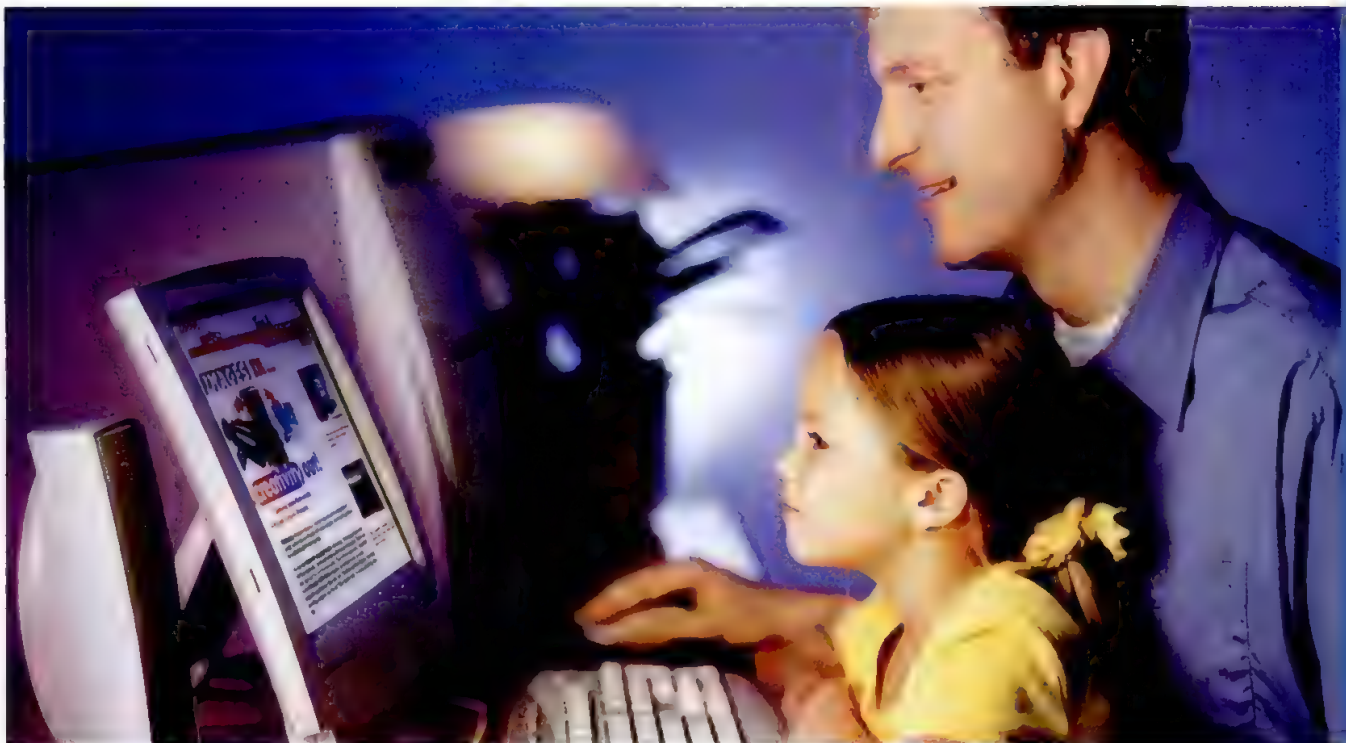
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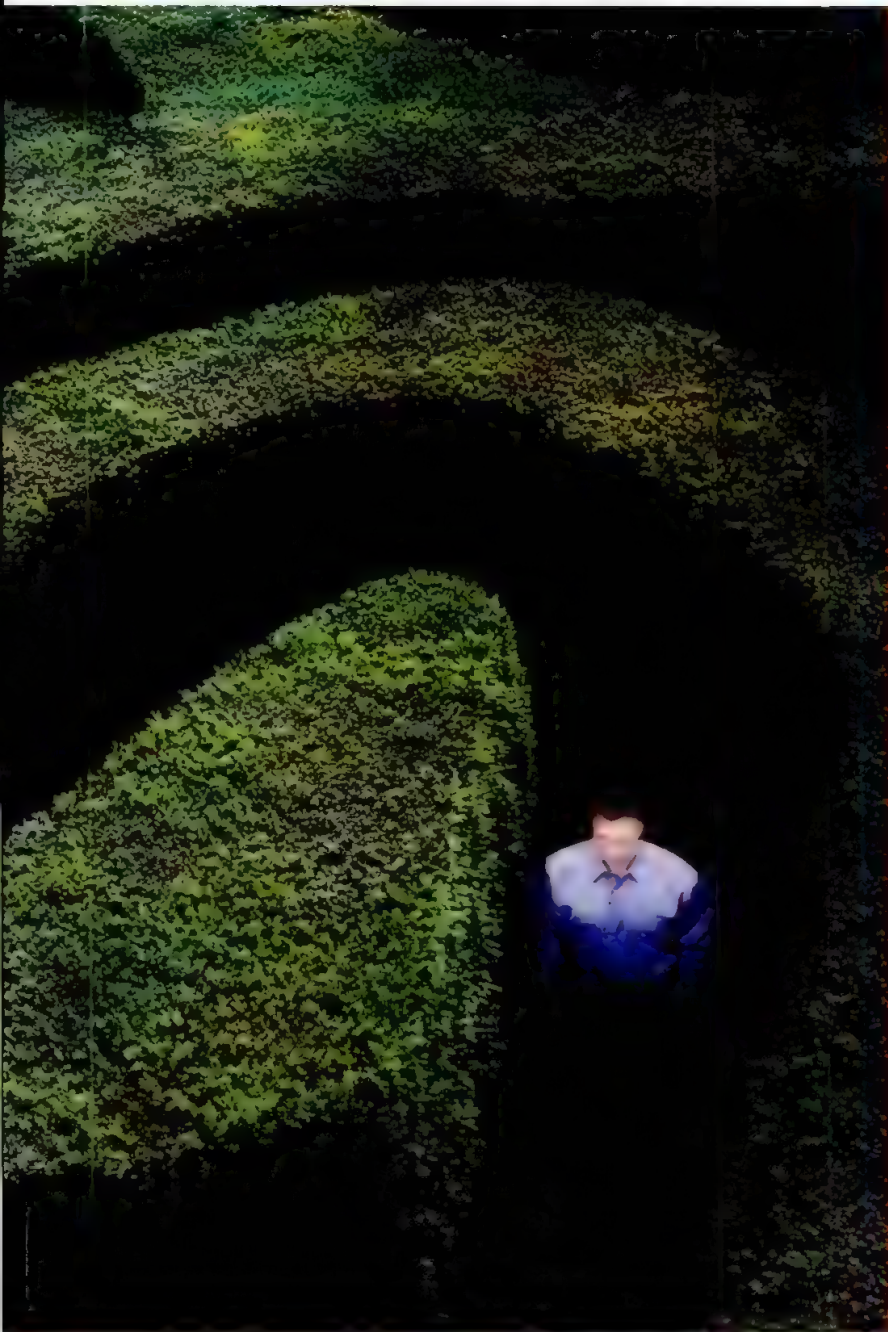
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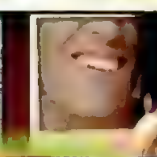
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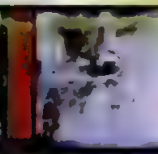
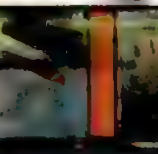
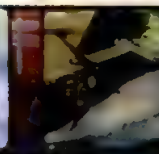


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LETTERS

WINDOWS 2000

Thanks but no thanks for the overview of Windows NT 5.0 ("NT 5.0 Preview," November 17). When I saw the huge "NT 5" on the cover I decided to do a search for a similar treatment of NetWare 5. It was nowhere to be found in that issue. I suppose it's silly of me to think you might give an actual shipping product (as opposed to software that probably won't see the inside of shrink-wrap until sometime in the fall of '99) the time of day.

LARRY SCHENKER
via the Internet

I'd like to know why your First Looks review of NetWare 5 ("Novell's NetWare Turns 5," November 3, page 45) was so short, while Windows NT 5.0, which isn't even shipping, made the cover of your November 17 issue? It seems to me that most people would be more interested in a product they could actually buy than one about which they could only speculate.

STEVEN BERGHORN
via the Internet

I have generally found *PC Magazine* a good source of news on mainstream PC products, so I am disgusted with the magazine's habit of ignoring Linux. You gave Linux a tiny paragraph in the October software preview, and your November 17 issue on Windows NT 5.0 mentions Linux just once in the Pipeline section. Windows NT 5.0 got 11 full pages. Windows is the main OS in the PC market, so it rightly gets the most attention. However, that doesn't excuse the fact that you're giving a product that doesn't yet exist more than 500 times the coverage of Linux, which is the world's fastest-growing operating system.

BENJAMIN SCOTT
via the Internet

Two features stood out in your November 17 issue: your in-depth review of Windows NT 5.0 beta and your complete lack of any Linux coverage at all. I shouldn't really say a complete lack of coverage, because two of your seven Pipeline articles discussed Open Source or Linux-related news.

If Linux and Open Source made up two-sevenths of the news this month, why did they make up 0 percent of the features? An in-depth feature on Linux and what it means for users at all levels (such as server, workstation, home desktop) would be a wonderful balancing addition to your Windows-heavy coverage. I'm not a rabid Linux booster, but I've found it hard to make an educated decision on which OS to buy, since there's been far too little coverage of the issue in the mainstream computer press.

JOHN ZEDLEWSKI
via the Internet

BUY AND SELL ON THE WEB

Before I read your feature "Buy It on the Web" (November 17), I had never heard of Chumbo.com, your Editors' Choice for online software shopping, so I visited the site to check it out. You said it "does a good job of letting users browse its inventory." I disagree. I tried looking for Web authoring software and, finding no category that seemed right, searched by product name. I found that the categorization was (to put it kindly) haphazard: HoTMetaL PRO 5.0 was categorized under "Business/Authoring Tool" together with Adobe PageMill. Symantec's Visual Page was listed under "Programming/Development Utilities and Libraries," and Macromedia's Dreamweaver came under "Graphics and Media/Presentation, Graphics/Multimedia Authoring."

How did Windows NT 5.0, which isn't even shipping, make your November 17 cover?

I couldn't find Allaire's HomeSite or NetObjects Fusion at all. If I had not been familiar with some of the products and had limited my search to browsing by category, I might have chosen Business/Authoring Tools as the closest category and thought that Chumbo.com carries only PageMill and HoTMetaT PRO 5.0.

MITCHELL WEITZ
via the Internet

Your article about e-commerce sites didn't go far enough in looking at Shopping.com. Having a good search engine for products is okay; having a good customer service department, however, is essential. Either the telephones are always busy there, or you are put on hold for 20 minutes, then prompted to leave a message, only to hear a few minutes later that the voice mailbox is full. Faxing or e-mailing the company gets you nowhere, either.

There are numerous posts on user groups warning people not to shop at Shopping.com for just these reasons. I think you do your readership a disservice in implying that companies like Shopping.com are good companies with which to do business. Your putting Shopping.com in the same article with Amazon.com led me to believe that the former was a reputable company. Not!

WILLIAM P. ENDRES
via the Internet

CPU TEST

Let me commend you on the Trends article in the October 20 issue of *PC Magazine* ("The

Big Test"). I was the chief architect of the Pentium Pro processor here at Intel and was in charge of pre-silicon validation, so the subject of design correctness and verification is near and dear to me. One nit: If one wants to estimate the number of internal machine states one must cover in order to validate a design, one must take into account a far larger space than you imply with your estimate of 2 raised to 5.5 million.

Your number gives all possible states of the CPU itself. It does not take into account the additional contributions to state of the external L2 cache, the memory, and the I/O subsystem. But those pale in comparison to the biggie: It's the sequences of states where the really difficult bugs live. And those sequences can be infinitely long. For the purposes of estimation, I'd say that most sequences can be safely chopped to around 10 to 20, but still....

BOB COLWELL
via the Internet

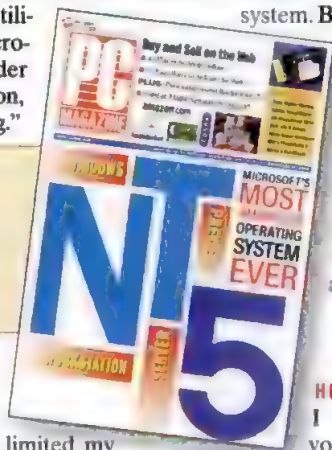
HOT NEW PRINTERS

I was very pleased with your recent review of ink jet printers ("The Best New Printers," November 3) until I got to the sidebar "Consumables: The Hidden Cost" (page 130). The author states that "if a problem with your printer is traced to a third-party cartridge, the printer manufacturer has the option of voiding the warranty...."

If this is true, it's very unfair. I understand that printer manufacturers push the use of their own consumables in their products because consumables, in fact, are the bloodline of ink jet profits rather than the relatively low-margin printers themselves. But printer companies shouldn't make you use their products. I'm sure General Motors would recommend that you use Goodwrench oil and a Goodwrench oil filter in all GM engines for best performance, but we all know that a replacement other than Goodwrench will work fine without damaging the car, or the warranty, as long as the substitute is installed properly and its design is consistent with the requirements of the vehicle. All I have to say is "Shop smart, save smart."

BOB NEDVED
Columbus, Ohio

We checked this point again with Hewlett-Packard. Its current policy is that if damage to an HP printer can be attributed directly to the use of a non-HP cartridge, then warranty terms and conditions may be voided.—Ed.



“...one of the best color ink jet printers ever made...”

“Text looked as if it came from a high-resolution laser printer.”

“a steal at \$250”

“We were impressed with the BJC-5000's bang-on color...”

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*Average yield based on two BC-23 Enhanced Black BJ Cartridges at 5% coverage. **1440 x 720 dpi requires optional specialty paper. ***7-color printing with optional BC-22e Photo Ink cartridge and specialty paper. Based on estimated street price. Dealer prices may vary.

PC Magazine liked our color printer so much, they put it in black and white.

We gave the editors at PC Magazine our BJC-5000 Color Bubble Jet printer for review. As you can see, what we received in return was pretty impressive. For more information, come and visit our Web site at www.ccsi.canon.com/2heads or give us a call at 1-800-OK-CANON.

See what we mean.™ 

While I always enjoy your printer issue, I feel you overlooked a very important aspect of printers in your November 3 story, namely the ease and quality of printing envelopes. In my office, about 20 percent of our printers' output is on envelopes. Since I'm a professional person and the first thing a client sees when I send something is the envelope, it's extremely important to me that a printer put out a very attractive envelope. Until I went printer shopping several months ago, I didn't realize that Hewlett-Packard is the only printer manufacturer that makes an envelope bypass standard. All other printers require you to remove the media, feed in the envelope, and then replace the media. In my opinion, in any printer comparison where HP is even close, HP deserves the Editors' Choice award for being thoughtful enough to put an envelope bypass into every printer it makes.

RONN BRACKLE
Fairbury, NE

MONEY MANAGER

After reading the review of Quicken 99 ("Money Manager," November 3, page 56) I quickly ran out and bought the product. Much to my dismay I found that its whole look, touch, and feel was completely changed from the previous release. Having to relearn a product every time you buy an update is extremely time-consuming. Is it too much to ask for some continuity? In the future your reviewers should address these concerns.

RICHARD HAASS
via the Internet

AGAIN WITH THE IMAC

I loved your comparison tests between the iMac and PC ("The Intriguing iMac," October 20, page 56), and I enjoyed the responses they engendered in the Mac community. It appears

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Corrections and Amplifications

In the Features Table of our November 3 story "The Best New Printers," we incorrectly stated that the Canon BJC-5000 includes drivers for Windows NT. Users must download the Windows NT driver from Canon's Web site.

In the Inside PC Labs column "iMac Performance: Fact and Fiction" (November 3, page 29), we inadvertently printed the Dell Celeron's Adobe Acrobat Search speed instead of its Scroll speed. The score should be 50 seconds, not 7 seconds.

In our November 17 First Looks review "Put USB to Good Use" (page 68), we incorrectly stated that the Microsoft Cordless PC Phone System has a USB interface. In fact, it is a serial-port device.

you did quite a comprehensive set of tests; maybe, in fact, too comprehensive. Guessing from some of the comments about your story (which, in my opinion, was very fair), I fear that the story was too technical for some Mac users. Keep up the good work. There are a lot of PC users who appreciate your effort and technical expertise.

DARYL MIYASAKI
via the Internet

TURBO REFRIGERATOR

I think that Jake Kirchner made a basic error in his argument that the "old" items in our houses work fine, yet our computers are no good after a short time ("Today's PC: Inexpensive and Obsolete," October 20).

The truth is that while the old items are still performing the tasks we bought them for, they're not doing any new ones. Your 25-year-old stereo still works, for example, but doesn't produce Dolby Digital five-channel output. Your 10-year-old refrigerator keeps your food cold but doesn't provide different humidity zones. By contrast, the computer you bought 15 years ago still performs the tasks you asked of it when you bought it; and with an upgrade, it will also perform a host of other tricks. If you wanted your stereo to drive your home theater, you would not complain about upgrading your receiver, yet you balk at doing the same for your computer. If anything, your computer is capable of doing far more in the way of new tasks than most items you own.

JOHN THEUNE
via the Internet

LATE NIGHT WITH SEYMOUR

Jim Seymour has it right in his November 3 column "Smart Printer Tricks." We have had an HP DeskJet 1120C Professional Series printer networked via an HP JetDirect EX Plus for the last three months in our County Department of Planning and Development office. We use it to print everything from color zoning maps to digital ortho photos. As more staff members become familiar with its capabilities, I expect it to rival our two LaserJet IVs for general use and perhaps eclipse them when our GIS system comes online. It has been a good addition to our lineup. If only a LaserJet could do color prints so reasonably...

MEL ERICKSON
Eau Claire County, WI

Y2K LIVES AGAIN

I was disappointed with your PC Tech column on SQL language (November 3). In the EMPLOYEES table, not only does the NOT NULL attribute on FIRST_NAME prohibit the entering of a single name (my full legal name is Aahz, although I've used Aahz Maruch), but the 10- and 13- character constraints on FIRST_NAME and LAST_NAME would prohibit the entering of many common names.

Haven't we learned anything from the Y2K crisis? When will we stop putting inappropriate computer constraints on real human attributes?

AAHZ MARUCH
via the Internet

NO LAPTOP COMPUTING

As a junior at the University of Florida, I found Michael J. Miller's assessment of how technology has changed in the classroom puzzling ("Classroom Computing," November 3). My university has a stringent computer policy that was just put into effect beginning this past summer. For some majors the school recommends purchasing laptops; there are no classes that I know of, however, in which a professor would allow a laptop to be used in the classroom. (Some professors won't even allow students to use calculators in Calculus III.) As a student who is preparing for a dual degree in Computers and Electrical Engineering, I find this most curious.

There are some professors who do make an effort to integrate technology into the classroom, but the number is limited. For example, in my Signals and Systems class, we use MatLab for analyzing frequencies, but only outside of class and rarely.

The situation worries me because I will need to find a job in the next two years. When guest speakers come to the university to talk about their respective companies, they mention programs at use in their offices such as MathCad, MatLab, Pro E, and PSpice. I am familiar with these programs, but only because I have played with them at home. I fully agree that technology has the ability to improve education at any institute. But until universities start pushing new technology on their professors, students will lose out.

DENNIS POORE
via the Internet

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The Concept PC 2000

Is the truly easy-to-use PC just around the corner?

Why do close to 60 percent of the U.S. households not own computers? One reason is because computers are still just too hard to use. That's why computer industry titans are pouring money into research to invent hardware and software that avoid complexity and captivate first-time buyers.

Recently, Intel drew up a blueprint for a desktop computer of the future that's designed to simplify setup and installation of new hardware and software significantly. Its concept PC comes on the heels of the overwhelming success of the Apple iMac—a futuristic-looking desktop computer designed for ease of use. Intel demonstrated a prototype—a legacy-free PC—that is not meant for production but is intended to spark innovative ideas among computer makers.

Code-named Aztec by industrial design

firm Ziba Design, the system is different not only in how it performs but also in how it looks and sounds. It's a sleek, orange pyramid that weighs about 8 pounds and runs at an ultralow noise level. It boots quickly and comes ready to connect at high speed to a home network and to the Internet.

To add a printer, a joystick, a scanner, a digital camera, or speakers, you simply plug a cable into one of the Universal Serial Bus (USB) ports as you would plug a toaster into a wall outlet. And there's no need to open the system and mess around with installing a card. Consumer electronics gadgets such as digital camcorders and DVD players connect just as easily through one of the two high-speed IEEE 1394 ports.

While the ease of use softens the computer's image for new users, the performance appeals to existing users. Inside there's a 500-MHz

processor, a 100-MHz system bus, 128MB of memory, an Intel 740 graphics chip, a 6GB hard disk, and a DVD/CD-ROM drive.

Don't look for Aztec-inspired systems to show up overnight. Their rollout will be gradual. Intel expects that in the second half of this year, computer makers will ship systems without unruly ISA slots. And in the second half of next year, systems will shed their game ports, parallel ports, serial ports, and floppy disk drives.

SOFTWARE SIMPLICITY

On the software side, companies such as IBM and Microsoft are deeply involved in creating a simple interface designed to broaden computer purchases among newcomers. Much of IBM's work on new interfaces centers on voice recognition and *multimodal* input, which combines voice, handwriting, and keyboard.

Considering all the hoopla over speech recognition, you'd think that the computer keyboard was doomed. Far from it. The keyboard will remain popular for years to come, especially for those who can type more efficiently than the PC can decode their spoken words.

But not everyone is keyboard-centric. The difficulty of typing Chinese ideograms, for instance, is so complex that speech recognition is the key to opening the vast Chinese market. Microsoft recently announced that it will invest \$80 million over the next six years in its Beijing research lab. IBM's research team in Yorktown Heights, New York, has made significant strides in Chinese speech recognition, and the work has paid off. Computers sold in China now come complete with the Chinese version of ViaVoice 98. The research lab's work on *text-independent* speech recognition is key to the company's grand vision, in which you'll speak to your computer in a conversational way—not a stilted, awkward way.

"We're trying to change the whole user interface so the reluctant novice doesn't have to learn to use the machine," says Ozzie Osborne, general manager of IBM's speech systems division. "If it's easier to use, more people will jump on. That's why IBM has poured so much money into speech recognition," he adds. In fact, IBM sees practically no limit as to just how many people will use computers in the future. The company has its eyes on all the thin clients in common use around the world today—telephones. Says Osborne, "IBM is after all of the people who use a telephone."—Carol Levin



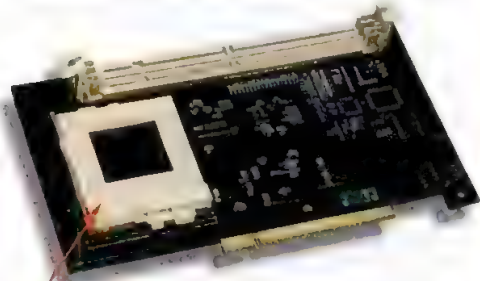
What's Inside Intel's Legacy-Free PC?

The blueprint for Intel's prototype PC for the future calls for ease-of-use features intended to make computers less intimidating and more appealing to a broad range of users.

- Smaller, sleeker, quieter design
- Simple setup and expandability
- Quick boot, resume, and launch
- Broadband-ready connection
- 500-MHz processor
- Accelerated Graphics Port (AGP)
- 128MB of memory
- 6GB hard disk
- DVD/CD-ROM drive
- Intel 740 graphics chip
- Four USB ports for printers, scanners, digital cameras, speakers
- Two IEEE 1394 (FireWire) ports for digital camcorders, DVD players

Attention, PC Upgraders

Think PCI slots and you probably think peripherals: graphics cards, modems, network cards, and many other PC-expansion possibilities. Evergreen Technologies thinks processor upgrade. Scheduled for launch early this year, the EclipsePCI is the first upgrade processor that plugs directly into a PCI slot. Until now, you've been able to upgrade 486-based systems and low-level Pentiums to the perfor-



PENTIUM II ON PCI: If your PC has a PCI slot, you can upgrade it to a Pentium II with Evergreen Technologies' EclipsePCI card.

mance level of a high-end Pentium but not to the level of a Pentium II. Now you can.

Intel holds a patent on the Pentium II bus, so competitors can't produce silicon that serves as a bridge from a Pentium socket to a Pentium II. And Intel doesn't provide an upgrade from the Pentium to the Pentium II. Prevented from providing a Pentium II upgrade that plugs into the 486 or Pentium socket, Evergreen decided to go through the PCI bus. The processor is the Socket 370 version of the Intel Celeron chip—a new version of the value Pentium II chip with 370 pins, which plugs into a entirely new socket.

Evergreen has placed the processor, the memory, and part of the chip set on a PCI card. When you plug it in, the BIOS recognizes the old components and goes through its normal initialization process. The BIOS then recognizes the new PCI card, and the processor on the PCI card boots the operating system. You don't have to change jumper settings, reload the operating system, or change the BIOS settings.

Evergreen estimates its target worldwide market at 250 to 300 million users of suitable PCs (486s, Pentiums, Pentium MMXs, and Pentium Pros) with PCI slots. Estimates from market research firm International Data Corp. are more conservative, ranging from 185 to 225 million suitable PCs.

Upgrades start at \$199 (list) for the platform alone; a typical upgrade with a 333-MHz Intel Celeron processor and 64MB of RAM should be under \$400.—*Sharon Nash*

Display Quality: Signals Matter



Most of us are quick to blame our monitors when we see visual flaws such as out-of-focus text or fuzzy images. In PC Magazine Labs' recent investigations, we learned that the graphics adapter is just as likely to be the culprit. With 17-inch and 19-inch monitors now popular, resolutions of 1,024-by-768 or higher commonplace, and high refresh rates for flicker-free viewing a must, we're challenging graphics adapters to produce accurate signals at higher frequencies.

PC Labs examined the video signals of the 29 mainstream graphics cards reviewed in our feature "Who's the Fastest?" (December 1, 1998). To our surprise, we saw an appreciable variation in the video signals' quality. Although a graphics card's performance depends on the digital design of the chip and memory architecture as well as driver efficiency, signal quality depends more on the analog circuitry and the board's layout. Poor design, cheap components, and substandard manufacturing can result in noise, distortion, and crosstalk, as well as imbalance and mistracking of the analog signals from the RGB channels of

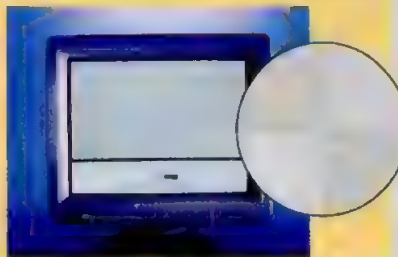
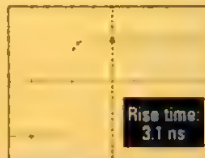
how well the graphics card can support a high-resolution display, in which pixels are packed close together, requiring fast changes to the voltage as the electron gun scans through a horizontal row of pixels.

The video bandwidth test screen is a good proving ground for the graphics cards' signal rise time. The monitors display images by shooting a ray of electrons onto the phosphor substrate on the tube one horizontal scan line at a time. As it scans across a line, the electron gun can maintain a steady voltage for a long period of time. But as it crosses the vertical lines, the voltage must be turned on and off very fast, because it must light up every other pixel.

A card with a slow signal rise time cannot respond with a full voltage at such a high frequency, because the signal cannot rise to the full level before being turned off. As a result, boxes with vertical lines are dimmer than those with horizontal lines.

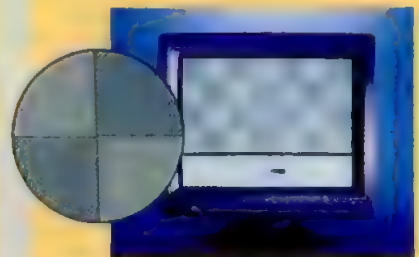
For more detail on the signal quality of each graphics adapter we tested, go to our Web site at www.pcmag.com. We strongly recommend that you consider these reports, but we also caution you to take into account your monitor and resolution.

GOOD SCREEN: Good video bandwidth and signal rise time make this card suitable for a high-resolution display for professionals involved in graphics-intensive work.



the digital-to-analog converter.

To identify the cards with these problems, we traced the video signals with a high-frequency digital oscilloscope and examined the resulting images using Sonera Technologies' program Display-Mate. The scope trace shows how fast the card's circuitry can switch from 0V (black) to full signal (white) in an abrupt transition. The signal rise time is an indicator of



POOR SCREEN: Poor video bandwidth and slow signal rise time relegate this card to undiscerning users who are content with a low-resolution display on a small monitor.



Problems visible on a cheap monitor may not appear on a high-end monitor. And some signal flaws may not matter on a low-resolution, low-frequency monitor. We have interpreted the results from the point of view of customers who require a high-resolution display on a high-end monitor, but we've also pointed out problems that may affect low-end users.—*S. Jae Yang and Glenn Menin*

SEMICONDUCTORS

Silicon Hits the Small Screen

TV stations in the U.S. have finally started sending high-definition digital television signals, and the implications of the event stretch beyond the broadcasting industry. Semiconductor makers small and large are racing for a piece of what may be a very big market in chips for digital televisions and related devices.

Market researchers at Dataquest foresee 30 million digital television devices on the market in 1988, giving rise to \$3.8 billion in annual chip sales for digital TV devices and associated set-top boxes, up from \$1.2 billion in digital TV chip sales for 1997. Companies working on chips for digital TVs and set-top boxes include ATI Technologies, IBM, LSI Logic, Lucent, Philips, PowerTV, and VLSI.

Smaller players in the digital TV chip race are working on innovative software/silicon

ideas. PowerTV, a small company based in Cupertino, California, is working on its Eagle chip for digital TV. The company complements the chip with a TV-centric browser within a small operating system, which lets you customize the way you watch digital programming.

According to Bow Rodgers, PowerTV's chief operating officer, the company is looking to developers to build apps for its digital TV software and the Eagle chip. "We believe the next wave of applications that will drive interactive TV will be electronic program guides, video-on-demand, and Web-leveraged apps such as e-mail, e-commerce, Web-casting, network games, and more," he says.

Meanwhile, Philips Semiconductor and Spyglass are partnering on a semiconductor/



software bundle similar to PowerTV's. Spyglass is porting its Web browser software Device Mosaic to the Philips TriMedia processor so that digital TV owners can browse the Web without additional boxes such as those required for Microsoft's WebTV. Developers can write custom applications to work with Spyglass's browser and the TriMedia chip on digital TVs.—Sebastian Rupley

A Self-Improvement Plan

I'm a firm believer in New Year's resolutions. For other people, that is. It's not that I'm perfect, of course; I'm just too busy trying to overcome my deficiencies to put a self-improvement plan into action. But the effort is laudable, and I applaud all who give it a try. In that spirit, I'd like to start off the new year by suggesting a few self-help projects for the PC industry.

I have in mind a few areas that seriously need improvement. I'm looking for developments that will take concerted effort but will be worth the work. More like finally giving up cigarettes and coffee and less like joining a health club you never visit. Specifically:

Bandwidth. Here's the number-one self-help task for the industry. People have got to be able to move beyond today's dial-up modems for Internet access. What's the good of an Internet economy if most people can't get to the online mall? What's the good of hooking up schools to the Internet if access is so slow that the students can't use the Web for research? Yes, everyone already knows this is an issue, but we also know high cholesterol is bad for our health, and nobody's doing much about that, either.

There are tens of millions of people accessing the Internet from their homes, but only a couple hundred thousand have high-speed access through DSL lines or cable modems. That number is growing too slowly, and the costs for these services are still too high. Does it make sense to offer \$500 PCs for Web access if users

then have to pay more than a thousand bucks a year in line charges and ISP fees?

Ease of Use. Again, this is a problem that everyone's been complaining about for years. Sort of like the extra 5 or 10 pounds that so many people swear they're going to lose but never do. The problem is that the industry seems convinced that only long-term technology advances—64-bit processors and reliable voice recognition, for example—will lead to computers that are easier to use. Wrong. I shouldn't have to talk to my word processor to get it to hide an annoying toolbar that just won't go away or to stop that insistent auto-formatting.

Because I just replaced both my desktop and laptop at work (here's a bonus resolution for you: don't do this unless you have to), I've spent a lot of time installing new versions of various software packages. So I can tell you that most software seriously lacks simple instructions for basic operations. On-screen help files are unfathomable, Internet-based support is too slow (see resolution No. 1), and paper documentation has all but disappeared. A little improvement effort here will go a long way.

Obsolescence. A couple months ago in this space, I inveighed against hardware that needs constant replacement, so I won't whine about it too much here. Let me just say that if you people in the hardware business think I'm going to spend \$500 to \$1,000 on a hand-held computing device that needs to be replaced every 12 to 18 months just to add a few new bells and whistles, you're nuts.

So that's it. A simple improvement plan. No more excuses! Get up off your duff and make it happen.

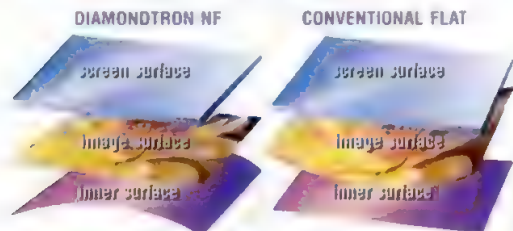


Jake Kirchner

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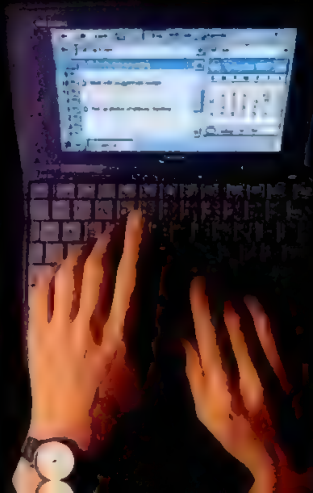
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DISPLAYS

FEDs Look Bright to Major Players

Most of the work to date on field emission displays (FEDs)—alternatives to liquid crystal displays (LCDs)—has been done by relatively small outfits, but recent advances in the technology have attracted the attention of some giants in the display market. The new interest could mean that in another year or two, you may well have an FED on your desk or in your dashboard.

FEDs are thin, but instead of working by blocking light the way an LCD does, they emit their own light at the front of the screen the way a cathode ray tube (CRT) does. A CRT is large and heavy because it has three electron guns mounted at the back of the tube, which send streams of electrons to excite phosphors. The phosphors then glow and emit light. By contrast, FEDs place hundreds of tiny electron emitters behind each phosphor dot. The result is a display that has the brightness, viewing angle, and high-speed response of a CRT, with the weight and thickness of an LCD.

FED panels have significant advantages over LCDs for some applications. They're brighter and easier to read in direct sunlight, and they update more rapidly, which makes them better suited for fast-changing images such as movies. FEDs can be manufactured using techniques similar to those used for semiconductors, and the built-in redundancy of extra emitter tips makes them much more rugged than LCDs. By contrast, a single failed transistor on an active-matrix LCD panel can create a noticeable defect.

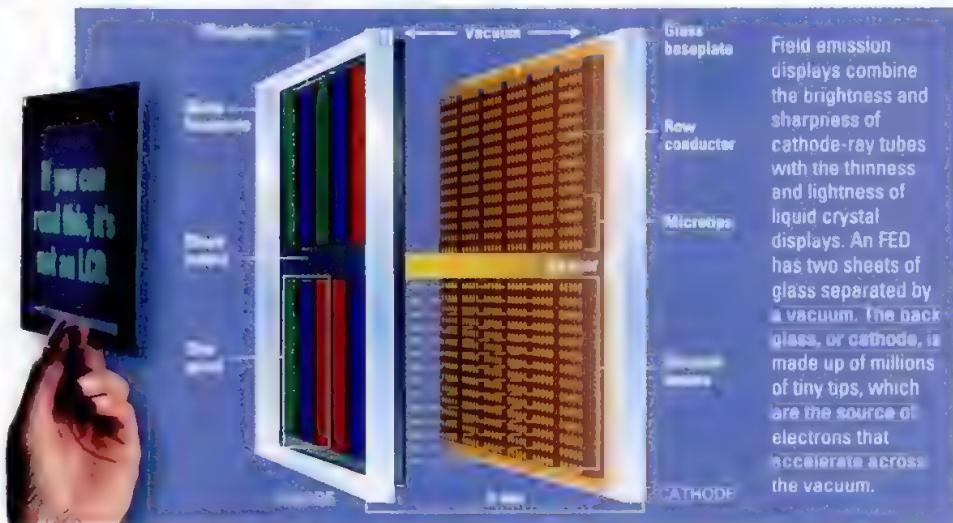
Sony recently announced a joint project with Candescent Technologies to develop FEDs. Candescent has been a leading proponent of "high-voltage" FED designs, which rely on about 5 kV to activate the emitters and offer the additional advantage of making it possible to use standard CRT phosphors. The goal of the Sony/Candescent project is to create 14-inch and larger full-color panels, ready for volume production in 2000.

Meanwhile, PixTech—the first company to produce commercial FED panels—has licensed its technology for low-voltage FEDs to Futaba, Motorola, and Raytheon. Motorola's Flat Panel Display division has been very active in FED research as well and has demonstrated full-color panels that are aimed initially at automotive and avionics

applications. PixTech has demonstrated a 320- by 240-pixel color FED panel and plans to have samples available in 1999.

The participation of these large companies in FED research and product develop-

ment validates the market and should make manufacturers more interested in using FED panels in their products. Increased participation on the part of the large companies should also create deeper pockets for funding new projects and result in quicker delivery of advances to production lines, where mass production can bring unit costs down to be competitive with existing technologies.—Alfred Poor



INTERNET ACCESS

The Bandwidth Bottleneck

Do you have a T1 line in your office? If so, consider yourself lucky. According to a recent study from ZD Market Intelligence, large companies still tend to connect to the Internet at very low access speeds. The study showed that of over 4,600 Fortune 1000 companies, 49 percent were still connecting at sub-T1 access speeds (below 1.544 megabits per second).

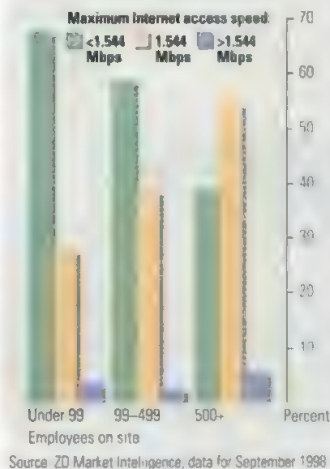
Large companies typically have greater bandwidth than smaller companies and consumers have, but what's surprising is that nearly half the large companies connect to the Internet at low access speeds. "Fortune 1000 companies lead the U.S. workplace market in bandwidth, but there are still many laggards," says Miran Chun, an analyst at ZD Market Intelligence. "Our data shows that smaller locations are

particularly bandwidth-constrained." The study found that only about 28 percent of company sites with fewer than 99 employees connect at T1 speeds or greater.

"The lack of high-speed bandwidth could be a serious obstacle to business on multiple fronts, from electronic commerce to corporate productivity," Chun says. "On the productivity front, users at many of the sites we studied are sharing less Internet bandwidth than the average home with a cable modem."

Microsoft CEO Bill Gates recently said that the primary bottleneck to optimal use of PCs is bandwidth. Intel CEO Craig Barrett echoed that sentiment, saying that limited communications bandwidth and ease of use are roadblocks to rapid expansion of the PC's capabilities.—Sebastian Rupley

Slow Going
A surprisingly low percentage of employees at Fortune 1000 sites connect to the Internet at T1 speeds



Microsoft Publisher 2000

Microsoft Publisher enters the new millennium—at least in version number—with all the strengths of Publisher 98 intact plus advanced new features and increased ease of use throughout. The new version, tested by PC Magazine Labs as a pre-beta release, offers tighter integration with the rest of the Microsoft Office 2000 suite and will be sold both as a standalone package and as a component of the Premium, Professional, and Small Business versions of Office 2000. The only version of Office 2000 that won't include Microsoft Publisher 2000 is the Standard version.

Publisher 2000's intended market is business and school users who lack graphics expertise but want to create stylish brochures and Web sites with minimal effort. These users are served interface enhancements such as a new Quick Publications wizard that creates simple one-page publications through a wizard interface. Earlier versions reserved

wizards for more complex publications.

Another new icon previews the current page in a Web browser—and Publisher does not complain if you use Netscape instead of Internet Explorer. Microsoft has enhanced page navigation with a row of miniature page icons on the status bar.

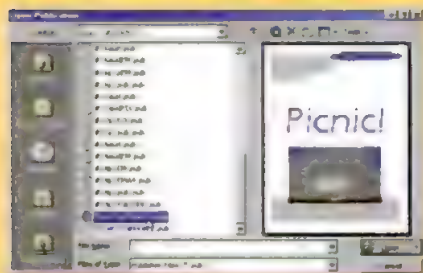
The basic menu and command structure is unchanged, but the formerly nonstandard File/Open dialog finally resembles the standard Windows File dialog, although it has the same enhancements found throughout the Office 2000 suite. These include an icon bar for quick access to recent documents and remote Web servers, and a preview window that sacrifices fine detail for speedy display. Publisher still opens only one file at a time, so you can't easily copy and paste between documents. You can't open Publisher 2000's new file format in earlier versions, but you can export documents in the earlier format.

Web integration, tighter than ever, uses a

wizard that saves sites directly to remote servers without requiring the site administrator to install a special script. As with all other shipping versions and current betas of Microsoft Office applications, this feature didn't work with the university-based server we used for testing, although all other applications use it effortlessly. A Web site wizard lets you build standard Web pages quickly by filling in forms, but as in earlier versions, Publisher buries deep in a dialog box the warning that "you will need to work closely with your ISP" if you want to receive the data users submit through the form.

With enhanced support for commercial color printing, Publisher 2000 edges toward high-end packages such as Adobe PageMaker and QuarkXPress without becoming a serious rival to either. The new version supports color trapping and Pantone color matching, and it includes wizards that embed TrueType fonts in publications.—*Edward Mendelson*

Highlights and New Features

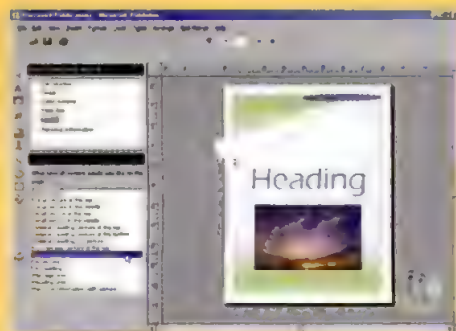
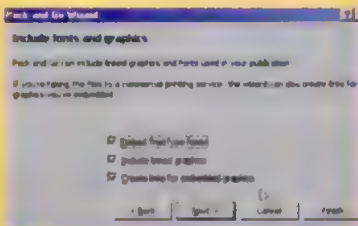


▲ FILE DIALOGS

The new Office 2000 File/Open and File/Save dialogs each include lists of recent documents, icons leading to the Favorites and My Documents folders, and a coarse-grained but fast-displaying preview.

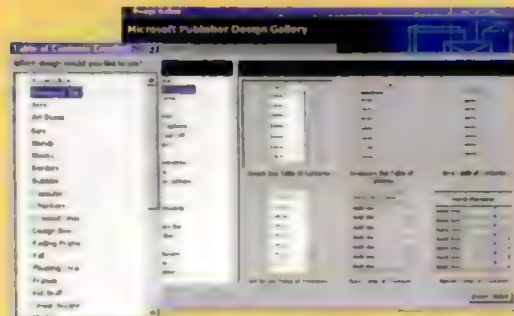
▼ PACK AND GO

The new Pack and Go Wizard creates a set of disks containing all the files you need for trouble-free output from a commercial print shop. The software prevents broken links to embedded graphics by creating links to files that are stored on the disks.



▲ PUBLICATION WIZARD

Using the Quick Publication Wizard, you can select the basic design of a publication and then proceed through a series of options, including a variety of detailed layouts. You can modify any layout once you've inserted it into a file.



◀ DESIGN GALLERY

You can easily insert page elements such as tables of contents by choosing from the previews in the Design Gallery. Once you insert a table in a document, you can choose from further design options using the Table of Contents Creation Wizard, far left.



◀ PANTONE COLOR

The industry-standard Pantone color system is now built into Publisher, although you have to work hard to find it. You enable it by going to a separate Color Printing dialog and switching Publisher's color system from the standard three-color RGB process to the four-color CMYK process.



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CACHE	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache
RAM	32MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
HARD DRIVE	4.0GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	13.4GB Ultra ATA hard drive*	14.4GB 7200 RPM Ultra ATA hard drive*
MONITOR	13" Micron 500Hz monitor (13.8" display)	17" Micron 700Hz monitor (15.9" display)	17" Micron 700Hz monitor (15.9" display)	19" Micron 900Hz monitor (18" display)	19" Micron 900Hz monitor (18" display)
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	6X DVD R1 ROM drive	6X DVD R1 ROM drive
MODEM	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**
GRAPHICS	Intel® Blm 328, 4MB SDRAM 3D AGP graphics	Intel® Blm 328, 4MB SDRAM 3D AGP graphics	Intel® Blm 328, 4MB SDRAM 3D AGP graphics	16MB Diamond Viper 500 TriT 2X AGP graphics	16MB Diamond Viper 500 TriT 2X AGP graphics
SOUND SYSTEM	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 128-voice WaveTable sound	PCI 128-voice WaveTable sound
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SCHOLARSHIP	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online
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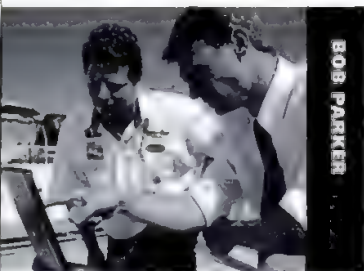
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RAM	32MB EDO DRAM	64MB SDRAM	64MB SDRAM	64MB SDRAM
Hard Drive	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*
Monitor	12.1" SVGA TFT display	13.3" XGA TFT display	14.1" XGA TFT display	14.1" XGA TFT display
Extra Storage	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)
DVD/CD-ROM	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	DVD-ROM drive (dedicated bay)
Graphics	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator
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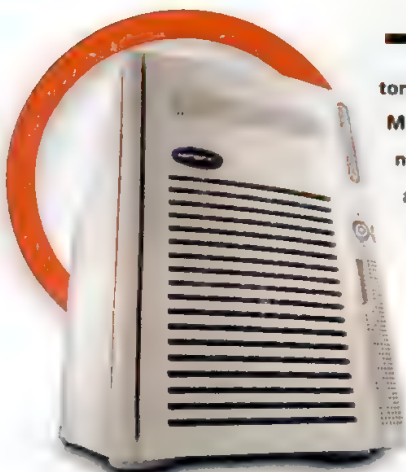
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you're starting to scratch the surface. Let's face it, when you're crawling around under someone's desk in a jungle of twisted cables because they want to see the dancing baby and you're the only one in the office that understands that "hot-swappable hard-drives" aren't something dirty, the last thing you need is a server that's anything but flawless.



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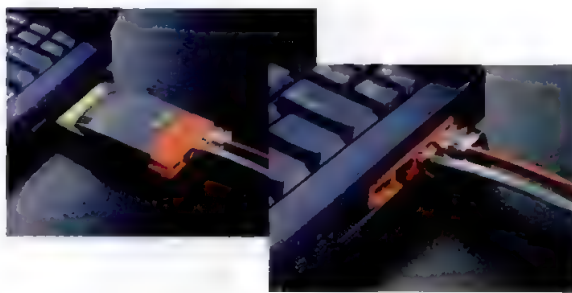
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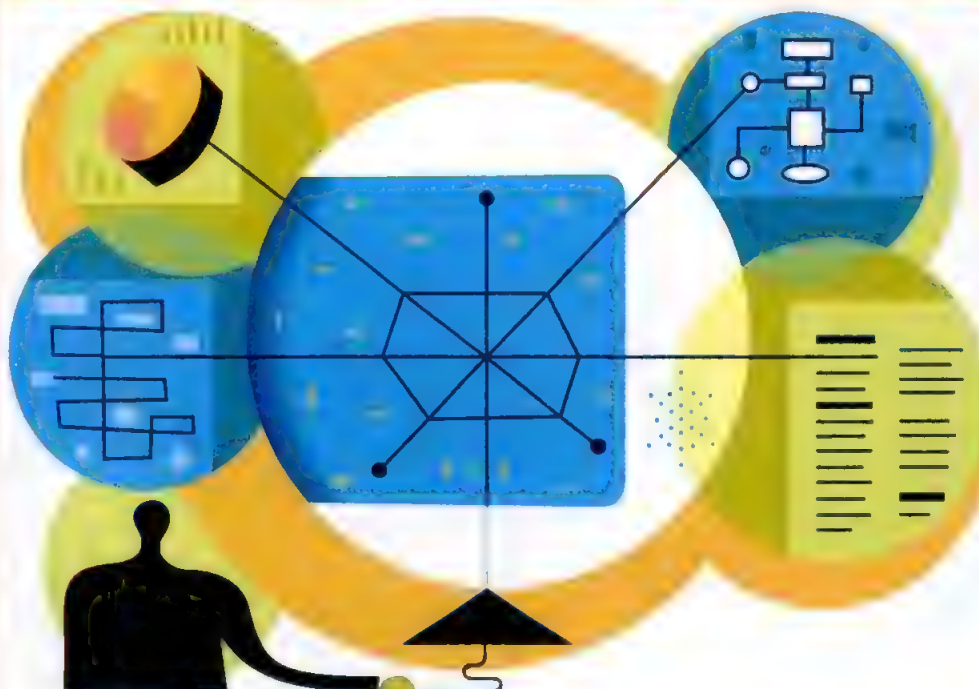


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Office 2000 Preview

Microsoft blurs the lines between its Windows operating system, its browser, and its applications suite.

By Edward Mendelson

When Office 2000 hits retail shelves in the second quarter of 1999, it will contain the biggest upgrade yet to Microsoft Corp.'s office applications suite. It will also be the first version that's thoroughly integrated with the Internet and will include a new version of Microsoft's Internet Explorer Web browser—a component already tightly integrated with Windows. More than any other package, Office 2000 blurs the lines between the operating system, the browser, and your applications.

OPEN TO THE PUBLIC

For this review, we tested Beta 2 of the Office 2000 Premium package—the most fully packed version of Office, with new versions of Excel, Outlook, PowerPoint, Word, Access, Publisher,

FrontPage, Microsoft's new PhotoDraw image-editing package, and various small-business tools. In an unprecedented move, Microsoft made this beta version available to the public in mid-November, for a price of \$19.95; the price of the final version has not been set, but Microsoft indicates it will be comparable to the pricing of Office 97.

When the final product is ready to ship, a Standard version of the Office 2000 suite will also be available, containing only the first four of the applications listed above. A Small Business version will include Excel, Outlook, Publisher, Word, and small-business tools, and a Professional version will add Access and PowerPoint. Like all early betas, Office 2000 is plagued by bugs. Worse, since Office 2000 is so deeply intertwined with the OS, test it only if you plan to reformat your hard disk afterward.

TOTAL WEB INTEGRATION

Microsoft has built extensive Web-based collaboration features into Office 2000. Multiple users can attach color-coded comments in Word, Excel, and PowerPoint files stored on a remote Web server (with Microsoft's Office Server Extensions installed). And comments can be added to Office files stored in HTML and opened in a browser.

A new Web Folders feature lets users manipulate files on a Web server as if they were working on a local or network drive. An impressive ease-of-use feature automatically opens the Web address currently on display in the browser.

We weren't able to make this feature work with the Unix-based server that we used for our tests, however. A Microsoft representative confirmed that the Office developers have no plans to make the shipping ver-

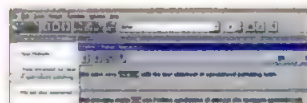
ON THE LIGHTER SIDE:

The Sharp Actius A100 UltraLite PC's full-size features belie its tiny size. Page 48.



PC ACHES AND PAINS?

Let CheckIt 98 diagnose your PC's hardware maladies. Page 60.



WIRELESS ETHERNET:

Aironet's 4800 Turbo DS Series brings Ethernet speeds to wireless networks. We look at the 11 Mbps-rated system's adapter and bridge that promise to set your network free. Page 75.



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FIRST LOOKS

sion compatible with a full range of servers, and that the Office Server Extensions will be required to make the feature work with some systems.

SmartSuite, on the other hand, effortlessly opened and saved files on our test Unix server that Office couldn't reach. Ordinary freeware File Transfer Protocol (FTP) clients allow the kind of remote file-management on all servers that Office manages only on some.

HTML EVERYWHERE

Office 2000 is designed equally for documents meant for the Web, documents meant for paper, and presentations. Word now doubles as a full-fledged HTML editor, with a wizard that builds frames easily. Excel and PowerPoint can save and open files in HTML format, and PowerPoint uses Web-based

PARTIAL INSTALL: Office 2000 uses Microsoft's new Windows Installer dialogs, which let you select components from a tree-style list.

image formats like animated GIF files.

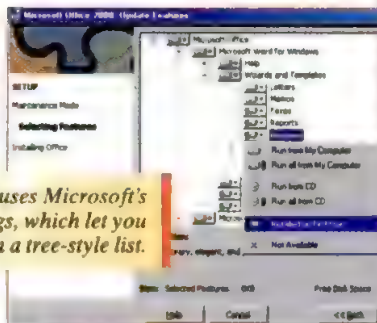
Many of the stylish graphics "themes" that provide consistent formatting in the FrontPage Web site editor are now usable in Word and PowerPoint. Integration with Microsoft's Net-Meeting conferencing software (installed with the suite) lets users collaborate on editing Office documents over the Web.

All Office applications now use HTML as a standard file format, in addition to the proprietary Excel, PowerPoint, and Word formats. Documents can be previewed in your browser during editing, even if that browser is Netscape Navigator. When a document is stored in HTML format, document summaries and other items not part of standard HTML are stored in Extensible Markup Language (XML) tags to make them available when the document is reopened in Office.

There's a serious pitfall in this

dual support for HTML and standard formats: Unless you change a default setting buried deep in the Options dialog, Word strips all formatting not supported by IE5 when you save a file as HTML. Worse, you can't get the formatting back, even if you immediately resave the file in DOC format.

A Microsoft spokesperson was dismayed when we reported this behavior, and there's a small chance that the shipping version may be safer. Also, unless this default setting is changed, some formatting options are grayed out in dialog boxes after you save the current file as HTML. Dialog boxes that change their appearance after



you save a file are a guaranteed source of confusion.

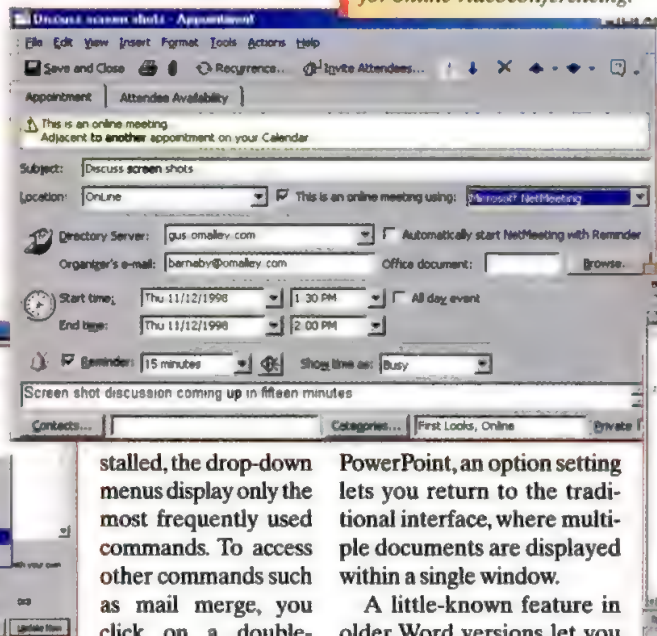
MENU OPTIONS AND MORPHING PAPER CLIPS

Office 2000's File/Open and File/Save commands are a major advance over earlier versions, with an expanded file list window and a new "Places Bar" on the left that resembles a Web site's navigation bar. The icons on the Places Bar bring up a list of recently opened files and folders, the contents of the Windows-standard My Documents and Favorites folder, the Windows desktop, and the remote Web Folders list.

The dialog's toolbar includes a browser-style back arrow that returns you to folders that you previously opened, but you can't use browser-standard keyboard shortcuts to perform the same function. Despite Microsoft's commitment to increased key-

board accessibility, there's no way to sort the display or create a Web Folder in the File/Open dialog without using a mouse.

Experienced users may be confused by Office's new menu system, which is designed to keep new users from being overwhelmed by Office's vast powers. When the package is first in-



stalled, the drop-down menus display only the most frequently used commands. To access other commands such as mail merge, you click on a double-arrow icon at the foot of each menu or wait an interminable-seeming few seconds; the hidden commands then appear on a lighter background.

To learn how to make Office less distracting, ask the Office Assistant, the animated paper clip that now morphs into a motorcycle, a pair of eyeglasses, and other surprising guises. The animation is stunningly detailed and ingenious, but its tricks get tiresome after a day or so.

Even with the animation permanently switched off, you can still ask natural-language questions in the HTML-style help system and get reasonably on-target answers.

A BLIZZARD OF WINDOWS

Most Office users, Microsoft learned, never figured out how to copy text from one document to another, so the new version automatically opens a separate

application window for every document you work on. If you have three Word documents open, each one gets a full set of menus and toolbars, and each has its own button on the Windows taskbar. With Excel and

SEE YOU LATER: Outlook's appointment setup screen includes options for online videoconferencing.

PowerPoint, an option setting lets you return to the traditional interface, where multiple documents are displayed within a single window.

A little-known feature in older Word versions let you copy multiple items to a special clipboard and then paste all of them into a file at once. Office 2000 extends this concept with a special Office Clipboard.

If you copy two or more selections without pasting the first, the Office Clipboard appears in the form of a toolbar with icons for each item copied and lets you paste one or all items into a document. The Office Clipboard can paste only into Office 2000 applications, forces you to copy something from an Office 2000 program before you can copy from a non-Office program, and doesn't let you remove individual items from its collection. Also, you can see the contents of each item only by moving the mouse over an icon to bring up a tool tip.

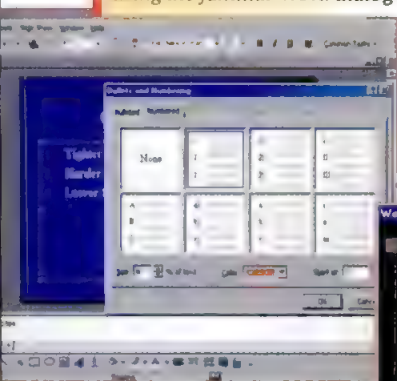
INSTALLING THE UPGRADE

The first sign of Office's massive changes is Microsoft's new installer, with huge, one-step

buttons for installing or removing Office, or for automatic repairs of missing or damaged files. Users who want fine control over what is installed on their system can open a tree-structured list of options.

By default, Office installs the most commonly used components and leaves others to be installed automatically when you first try to access them. You can specify which components to copy to the disk, to install on first use, or to run from the CD-ROM—or not to install at all.

1, 2, 3: New features in PowerPoint 2000 include automatic numbering using the familiar Word dialog box.



This system does produce some surprises. For example, the first time you right-click on a word in Word and choose "Synonyms" from the pop-up menu, Word interrupts your work, pops up a dialog box demanding the Office 2000 CD, and makes you wait while it installs the thesaurus-style synonym feature.

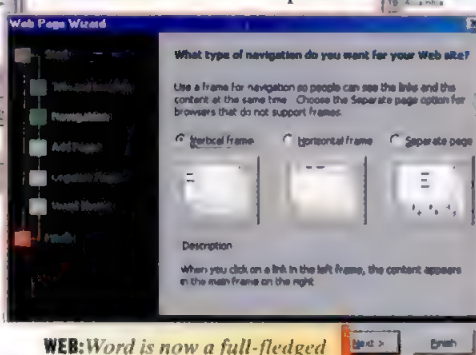
Network administrators will welcome the new Network Installation Wizard for automated, customized suite upgrades. And the Windows System Policy Editor can now be used for remote customization of menus and toolbars on client workstations. The installer has an option to retain earlier versions of Office applications, and these continue to function normally.

Don't install or upgrade Office when you've got an urgent

deadline, however. Even on a fast machine, a default install can take more than half an hour, complete with a reboot followed by a long delay while Windows reconfigures itself.

Office's self-repairing feature can be run on command from the help menu, but Office will also prompt you to run it when it detects missing or corrupted files. A separate utility opens whenever Windows starts up and, after you run Office applications a few times, offers to optimize the location of Office files on disk.

Only technical experts knew how to remove this kind of intrusive add-on in earlier Office versions, but there are now convenient controls for turning the utility off permanently. Before rolling out a company-wide upgrade, however, network administrators and corporate



WEB: Word is now a full-fledged HTML editor and can automatically create navigation bars in frames.

managers will need to study a test system thoroughly to learn exactly how Office modifies Windows.

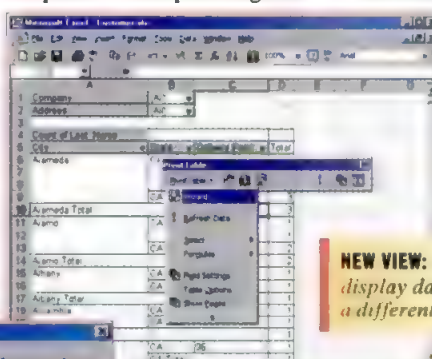
Multinational corporations will be grateful for Office's thorough international features. A single executable file for each application works with almost all languages and alphabets and allows easy input in right-to-left languages in systems set up for left-to-right languages.

The user interface and help files can be switched easily between languages, as can grammar and spell-checking tools. In many cases, Word can detect the language in which you type and

automatically adjust its spelling tools to match.

WEB-READY WORD

Microsoft has shoehorned new features into Word 2000 without bothering to remove many of the inconveniences of the old versions. But Word's Web-editing features are massively improved, with superb link management and frame support. Support is also provided for creating and debugging JavaScript and VBScript through the



brought back into view—remains largely unchanged. Automation features like on-the-fly grammar checking and automatic formatting are more reliable but still imperfect. The basic document structure is unchanged, and files saved by Word 2000 can be opened in Word 97.

Notable improvements in formatting include nested and side-by-side tables (as in HTML) and text that flows around tables. Nothing has been done to improve Word's unintuitive system of "sections" that mark off regions with margins different from the rest of the docu-

NEW VIEW: Excel's PivotTables display data in a database from a different perspective.

ment, however.

If you follow the instructions in the help system to change the margins in a part of your file, Word automatically inserts page breaks where the margins change. Only a Word expert will know how to get rid of them—a task that requires going to the Insert/Break menu before going to the File/Page Setup menu specified in the help file.

Interface enhancements include the ability to move the cursor anywhere on a blank page and start typing—without pressing the Enter key and space bar to get the right position.

EXCEL AND POWERPOINT

Excel 2000's enhancements are limited mostly to Web integration, PivotTables, and subtle interface details. Table data can be dragged from an IE browser window directly into a spreadsheet, and new software components installed with IE let you manipulate spreadsheets through a browser window. To make this work, the author has to switch on the interactivity

Microsoft Script Editor, accessible from the Tools/Macros menu (together with the traditional Visual Basic Editor).

The Save as Web Page dialog includes a button for changing the page's title—normally hidden in the HTML head tag. Word doesn't provide the automatically built navigation bars and server-side scripting features found in FrontPage, but it's the first word processor that works adequately as a Web editor.

For most paper-based documents, Word remains the first choice among word processors. But it still can't match Corel's WordPerfect in some common formatting tasks—such as placing left-aligned and right-aligned text on the same line or in handling complex multichapter documents.

Word's basic menu structure—once the hidden items are

FIRST LOOKS

feature when saving the spreadsheet in HTML format.

PivotTables (sheets that provide alternate views of data found elsewhere in a spreadsheet) can now be created with even more ease through a toolbar that lets you drag fields directly into the PivotTable, not just into a diagrammatic representation, as in earlier versions. A new PivotChart feature creates charts that refresh automatically when a PivotTable changes. But Excel still forces you to switch to a special preview mode to adjust page breaks.

PowerPoint 2000 works much like earlier versions—but with a new three-pane interface that lets you view the outline, slide, and notes on the same screen. HTML can be used as a native format, with options for creating files that work in one or more specific browser versions.

HTML-format presentations include a navigation frame at the foot of the window and an outline frame at the left,

NEW THEME: You can customize FrontPage's color schemes and graphics and save the theme under a new name

which can be turned off. Slides now automatically resize to fit the window as you create them, and text resizes to fit its frame.

Presenters may be most grateful for invisible improvements like the feature that hides the mouse pointer when it hasn't been moved for a while and reduces the sensitivity of the mouse so it doesn't reappear in response to small, inadvertent movements. Screen savers and screen-blanking power-management features are switched off during a presentation to avoid sudden blackouts.

ACCESS AND OUTLOOK

Access 2000 turns highly Web-centric in this new version, with wizards for creating HTML data-access pages. Other improvements include conditional

formatting in reports, so that specified fonts and colors appear only when certain conditions are met.

Many form properties can be changed directly in the form without switching to design view, and form controls can be grouped for easy manipulation during design. The new Unicode support means that Access has a different file format from earlier versions, but databases can be saved in the old format.

The Outlook 2000 PIM and mail client combine an impressive feature set with a distractingly fussy design. One of the best features is the main Outlook Today page, with its clear summary of current appointments and tasks, plus a count of e-mail messages in various folders.

The mail component resembles the superb Outlook Ex-

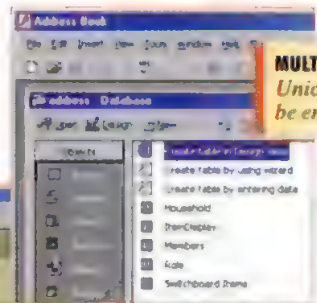
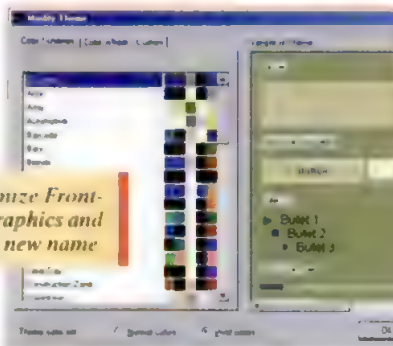
Corporate managers should set up the program with care to avoid support nightmares. The button used to switch from an Internet-only to a corporate configuration is on a menu that changes its name when you make the switch, making finding the button again difficult.

Microsoft licensed a reduced version of Symantec's WinFax and automatically installs it when you first create a fax from Outlook's File/New menu. When writing and sending faxes, you use the same interface used for sending mail, but be prepared for confusion if you try to customize your fax setup. Bafflingly, the fax

ment views in the same window and no longer damages imported HTML code. Graphics themes can be modified directly inside FrontPage, and the automated navigation toolbars built by the program can include external links, although these toolbars can't be customized as much as many Webmasters would like.

FrontPage finally uses the same File/Open dialog boxes as the rest of the Office suite, and also makes it easier to build a Web site in an ordinary disk folder instead of through the often-confusing Personal Web Server. Advanced users can program VisualBasic

MULTILINGUAL: Access 2000 supports Unicode, so multiple alphabets can all be entered in the same database.



options dialog offers you a choice between different ways to connect to the Internet but doesn't give you any option to configure your fax modem. Don't despair, however, because faxes are correctly sent via your modem.

Further complications arise in Outlook's handling of Internet (or intranet) news groups. Instead of integrating mail and news, as in Netscape Messenger or Microsoft's own Outlook Express, Outlook handles news-groups by launching a news-only copy of Outlook Express in a separate window. Microsoft will probably get Outlook right two or three versions down the road, but much of the current version seems to have been stuck together with chewing gum.

FRONTPAGE

Microsoft's Web site editor, FrontPage 2000, now displays its editing and site-manage-

macros to automate FrontPage's operations, but macros can't be recorded like macros in Excel, PowerPoint, or Word. Despite some usability problems, FrontPage remains by far the best tool for building complex Web sites without having to learn HTML.

THE BOTTOM LINE

Microsoft built a staggering number of enhancements and changes into Office 2000, and the suite continues to roar ahead of the competition in automation and new-user conveniences. But if you plan to upgrade from Office 97, you may prefer to wait until you can be certain the new suite won't cause incompatibilities with your existing systems. The more tightly Microsoft links its applications to the operating system, the more likely it becomes that problems in the applications will affect the OS as well.

Microsoft Office 2000 Premium Edition, Beta 2. Price: Beta version, \$19.95; price of shipping version not yet set. Microsoft Corp., Redmond, WA; 425-882-8080; www.microsoft.com/office; 421 at www.pcmag.com/infolink. **PC**

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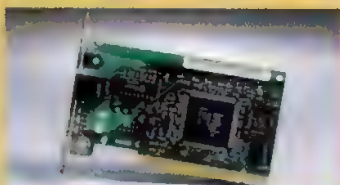
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Laptops Get Lighter

The Sharp Actius A100 UltraLite PC comes close to closing the gap between laptop and palmtop.

By Cade Metz

Much like the Sony VAIO 505, which so changed the PC industry's notion of the ultra-portable, the Sharp Actius A100 UltraLite PC is apt to beg the question: Why CE? Weighing 3.7 pounds with AC adapter and measuring just 1.1 inches at its thickest, the Actius A100 (\$2,000 street) is only slightly larger than many nascent Windows CE devices, yet it runs a full-fledged desktop OS and offers hardware similar to many of today's midrange notebooks.

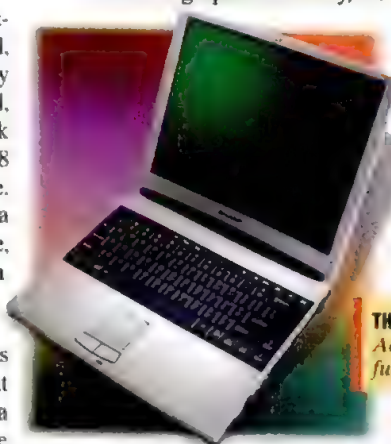
Though most high-end CE machines sell for roughly \$1,000 less than the Actius and have much longer battery lives, they don't offer the 233-MHz Pentium/MMX CPU, a 11.3-inch active matrix display, 64MB of

EDO RAM, and the 3.2GB hard disk of the Actius.

Encased in a conspicuous magnesium alloy shell, the Actius has a 10.2- by 8.4-inch footprint. Closed, it measures 1.1 inches thick in the rear and a scant 0.8 inches thick at its nose. Open, the Actius offers a touch pad pointing device, a compact keyboard, and a brilliant color display.

Naturally, the machine's I/O hardware has been scaled down—but only slightly. There's a 56Kbps V.90 software modem, a VGA port, audio jacks, volume knob, IrDA, PS/2 jack, and a single Type II PC Card slot. A 0.9-pound external floppy disk drive offers a second PS/2 jack and serial and parallel ports.

The Actius lasted 2 hours and 22 minutes under our Battery WinMark test, roughly 50 minutes longer than the VAIO. Equipped with 256K of L2 cache, 128-bit NeoMagic graphics, and 1.1MB of graphics memory, the



The Actius offers an extensive and easy-to-use power management interface under Windows 98, but any settings changed within this interface are not automatically changed within the system's BIOS. When the Windows settings are in conflict with the BIOS settings, the system defaults to the BIOS. The machine also had the irritating habit of entering standby mode when we accessed the Power Management interface directly after a boot-up.

Though Windows CE may still be the budget-conscious

THIN: The 1.1-inch thick Sharp Actius A100 UltraLite PC offers full-size notebook features.

Actius garnered a respectable 10.2 under the Business Winstone 99 test. You can't, however, squeeze much more performance from the unit; its base 64MB of RAM isn't upgradable.

choice, the Actius is the better value, offering a true notebook PC in the body of a hand-held. **Sharp Actius A100 UltraLite PC.** Street price: \$2,000. Sharp Electronics Corp., Mahwah, NJ; 800-237-4277; www.sharp-usa.com; 417 at www.pcmag.com/infolink.

WYSIWYG for Web Purists

Allaire's HomeSite 4.0: The best code-based Web editor goes (slightly) WYSIWYG.

By Edward Mendelson

Serious Web authors get their hands dirty with HTML code instead of giving up control to WYSIWYG editors. Allaire's HomeSite 4.0 (\$89 download, \$99 direct) brings new power and conveniences to one of the most popular and best-designed editors for raw HTML code—

style Tag Inspect, a stylesheet editor, and a tree-style diagram of the code in any HTML file.

HomeSite's interface consists of a resource panel, a large editing window, and optional top,

the screen displays tag and link validation results and squashed thumbnails of images in a folder or project. The main editing screen displays only one file at a time, but you can load multiple files and switch among.

The code-editing window supports customizable color-coding for scripts and automatic replacement of nonstandard characters with HTML "entity" codes. You can finally search and replace within only a selection, and the line number display is now correct even when word wrap is on.

Code-editing features include mouse-based shortcuts for selecting entire tags. But the keyboard interface remains badly implemented: You must use the mouse to switch between the resource panel and editing screen, and many standard Windows keystrokes work only in some parts of the program.

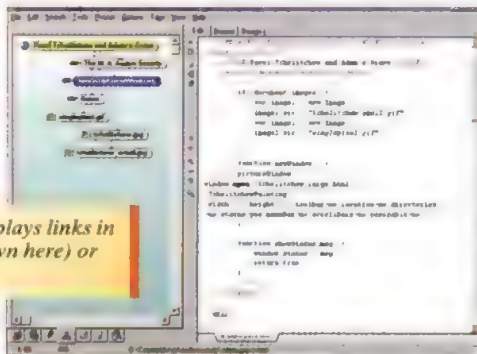
Don't expect much from the

new WYSIWYG design window. It gives no visual indication when you select multiple cells; text can be added from the keyboard but deleted only with the mouse. And unless you turn on and tweak HomeSite's Code Sweeper, your code may not come out of the design window exactly as it went in.

A simple built-in FTP client worked well in our tests but is the subject of dozens of complaints on Allaire's support forum. HomeSite is highly extensible, with easy-to-build links to third-party source control systems and a well-documented language for creating custom wizards and dialogs. The minor frustrations of HomeSite are a small price to pay for its unique power and convenience.

HomeSite 4.0. Direct price: \$99; download, \$89. Requires: 16MB RAM, 10MB hard disk space, Windows 95, 98, or NT 4.0 or later. Allaire Corp., Cambridge MA; 888-939-2545; www.allaire.com; 418 at www.pcmag.com/infolink.

LINK: HomeSite 4.0 displays links in an individual file (shown here) or across a full Web site.



and even adds a rudimentary WYSIWYG editing module.

This new version retains all the advanced editing features of HomeSite 3.x and adds diagrammatic representations of a file's hyperlinks, a spreadsheet-

bottom, and floating toolbars. The resource panel displays lists of files, a help index, reusable user-created code snippets, and diagrams of code and links.

A results panel at the foot of



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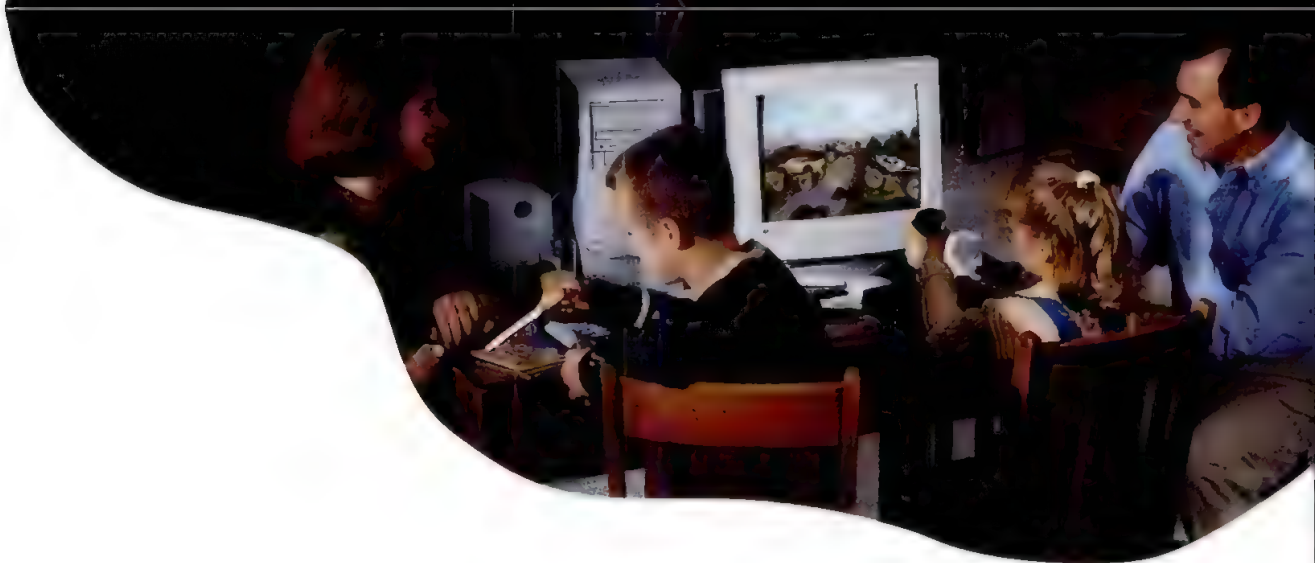


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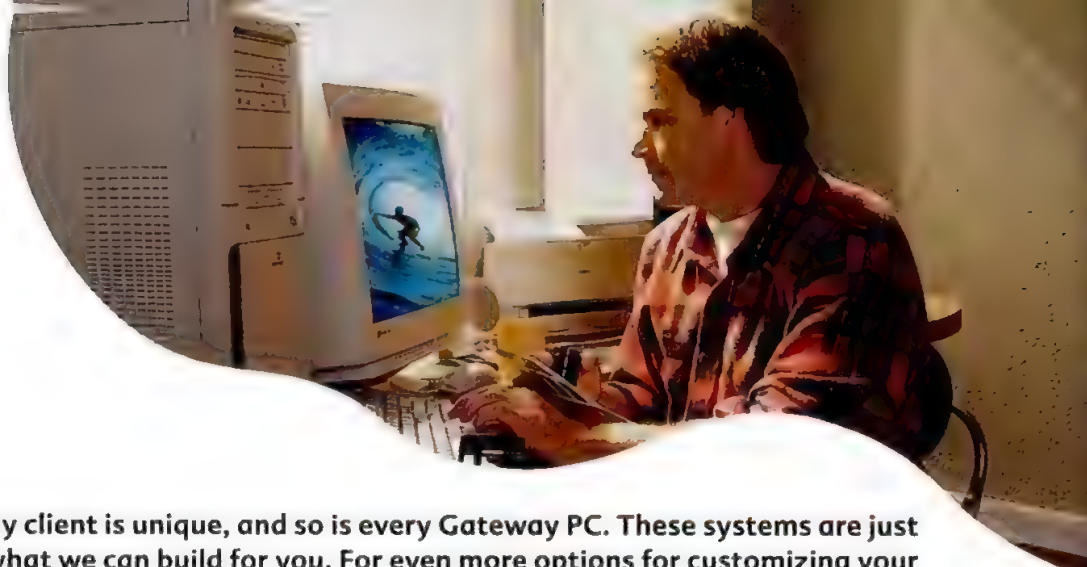


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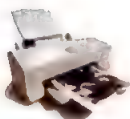


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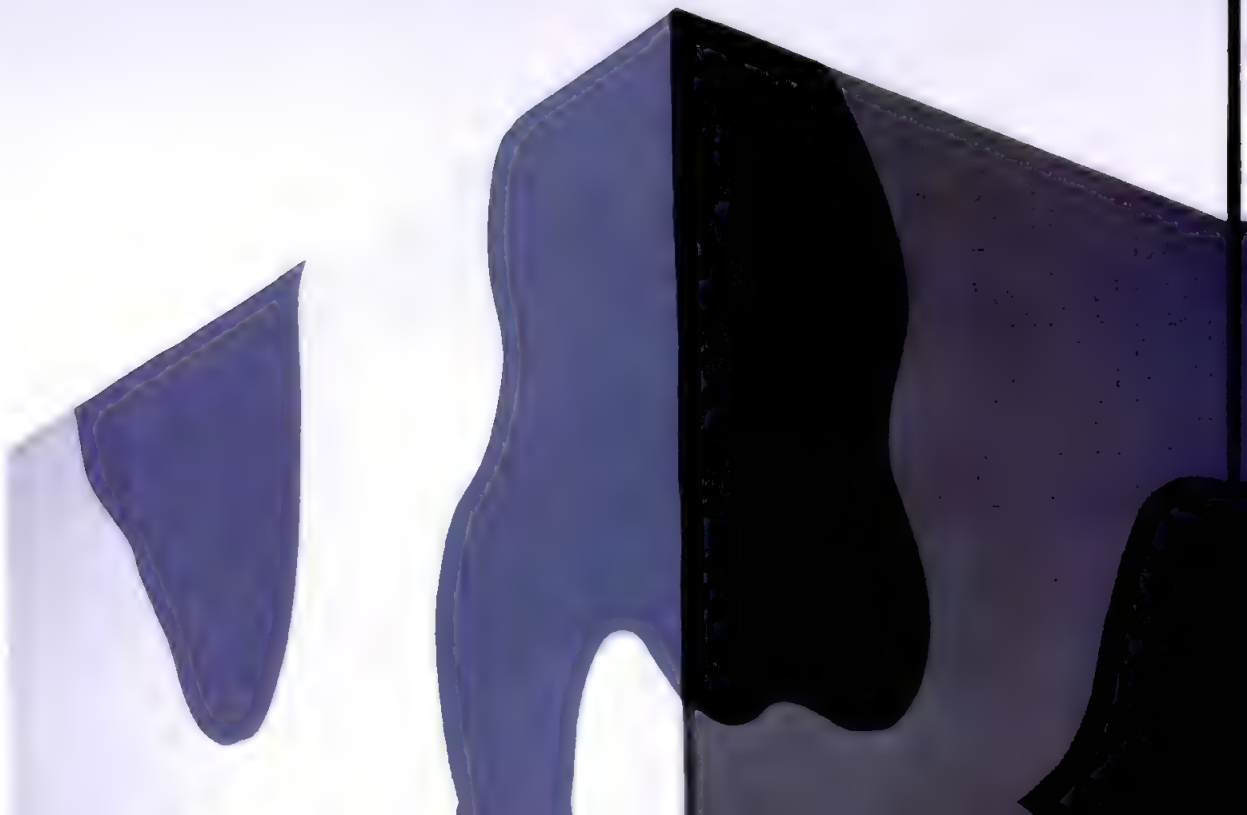
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OCR in Living Color

Caere's OmniPage Pro 9.0 adds precision color support to its already powerful feature set.

By Alfred Poor

This terrific OCR program just got even better. With Caere Corp.'s new OmniPage Pro 9.0, you can scan pages with a mix of text and graphics, convert the text, and still preserve the layout—including color graphics. The regular package has a street price of \$500, but a liberal competitive upgrade makes it available for \$100.

This latest version of OmniPage Pro builds on the features that made prior versions so successful: automatic zoning for text and graphics, multithreading support and scheduled batch processing, and on-screen display of the source image during proofreading. The most important new feature, though, is color support: OmniPage Pro can capture the text and

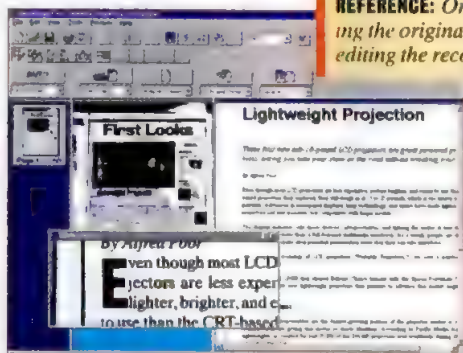
color images from a page in one pass. Other worthy new capabilities include recognition of tabular text to create formatted tables in Corel WordPerfect or

processing document that uses frames to position all elements precisely on the page—to a text-only output with no formatting. You can choose to have the output exported automatically as a word processing document or in another file format of your choice. The proofreader feature is

Page Pro managed to de-skew slanted images automatically and even righted an upside-down image before processing. Tables with color backgrounds gave the program some trouble when scanned in color, as it tended to identify some of the cells as graphics instead of text.

Handy as color scanning is, it requires a great deal of memory. Caere

REFERENCE: OmniPage Pro 9.0 provides a window showing the original scanned image that you can use when editing the recognized text in the document window.



more flexible now, and you can resize the image window to see more or less of the scanned image. You also get PageKeeper Standard, a \$39 document management program that can automatically index documents for search and retrieval.

On our tests, the OmniPage Pro did an excellent job with most pages. Complex magazine pages with snaking text columns, color images, and captions were processed almost perfectly, and the toolbar buttons made it easy to correct errors of judgment before performing OCR. Omni-

specifies 16MB of RAM as a minimum requirement, but even on a system with 32MB of RAM, the swap file was exercised heavily when we used the color-scan feature. Installing 64MB or more in your system should help the program run faster.

If your scanner came with any OCR software, you qualify for the upgrade version—and at \$100, OmniPage Pro 9.0 is a real bargain.

OmniPage Pro 9.0. Street price: \$500 (competitive upgrade, \$100). Caere Corp., Los Gatos, CA; 800-736-5735; www.caere.com; 420 at www.pcmag.com/infolink.

A PDA Connection

The UniPro PC 100 raises the bar on palm-size Windows CE PDAs with its 28.8-Kbps modem.

By Bruce Brown

Arriving a few months later than the first waves of palm-size Windows CE 2.0 devices is the Uniden UniPro PC 100 (\$449 list). With 8MB of RAM, the device stands out by virtue of its internal data/fax modem and folding docking station. The built-in modem enhances portability for short trips; but since the communications cable is permanently attached, you have to take the unit's docking station with you for synchronizing data, unless you use IrDA communications.

Based on a 75-MHz Philips PR 31700 processor, the UniPro has 8MB of ROM for the OS and standard Windows CE applications (a 4MB version is also

available, at \$379 list). The UniPro runs on two double-A batteries and has a rated battery life of 15 hours.

At 8.0 ounces (with batteries installed) and 5.3 by 3.4 by 0.8 inches (HWD), the UniPro is closer in size and weight to the Philips Nino than to smaller units. The dark gray UniPro comes with a stylus, an AC adapter, and the unique folding docking station. This feature is essential: Uniden doesn't sell extra docking stations or AC adapters.

The UniPro's backlit LCD screen—at 320-by-240 resolution, with 16 shades of gray—is 3.2 by 2.4 inches, the same size as other Windows CE palm-size devices. Unlike the bluish-green display

used by other vendors, though, the Uniden's backlit display is a pleasing gray. Like the Nino, the UniPro has buttons on both sides, with action buttons on the left and application buttons on the right. A CompactFlash Type

GRAY AREA: The UniPro's cool gray screen is a welcome change from ubiquitous bluish-green.

II slot is located on the unit's top edge, and the on/off/backlight button, microphone, and speaker are on the front.

The standard 28.8-Kbps V.34 modem's RJ-11 jack folds out from the upper-left back of the device, which means that if you use the modem without standing the unit in the docking station,

you'll have to hold the UniPro or place it face down on a table or desk. No communications software is included with the UniPro, nor is there any other

software beyond the standard Windows CE complement, including Voice Recorder, Pocket Outlook, Notetaker, and Jot for handwriting recognition.

What you do get with the UniPro PC 100 makes it a fine addition to the lineup of Windows CE palm-size PC choices.

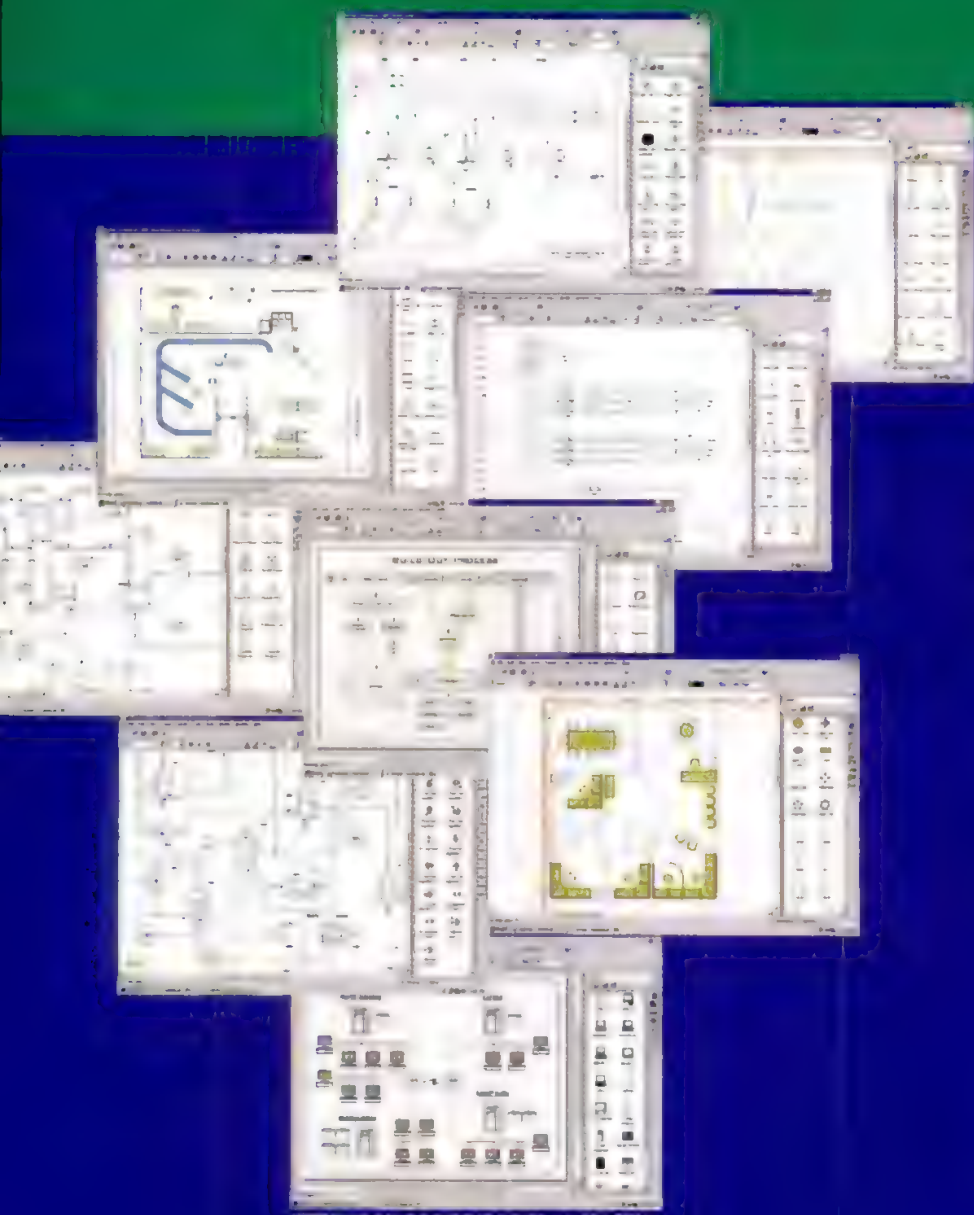
Uniden UniPro PC 100. List price: \$449. Uniden America Corp., Fort Worth, TX; 888-686-4336, 817-858-3300; www.uniden.com; 419 at www.pcmag.com/infolink.



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It's a PIM Evolution

Two products—one new, one improved—can make keeping track of your life a little easier.

By Kathy Yakal

The personal information manager (PIM) has always been a great concept. It keeps track of your schedule, to-do lists, and address book—all in one location. But many PIMs have come and gone because they weren't personal enough, or they were just too dang hard to use. And managing some PIMs can be so time-consuming that you're too busy to do the things on your task list.

One brand-new PIM and a revision of an old favorite take different approaches to dealing with those problems. OneStep Connect emphasizes the communication element of personal information management, simplifying the process of sending paper correspondence, faxes, and e-mail. The other PIM, Info Select 5, tries to save you time with its outline-based structure and provides tools for managing random information quickly.

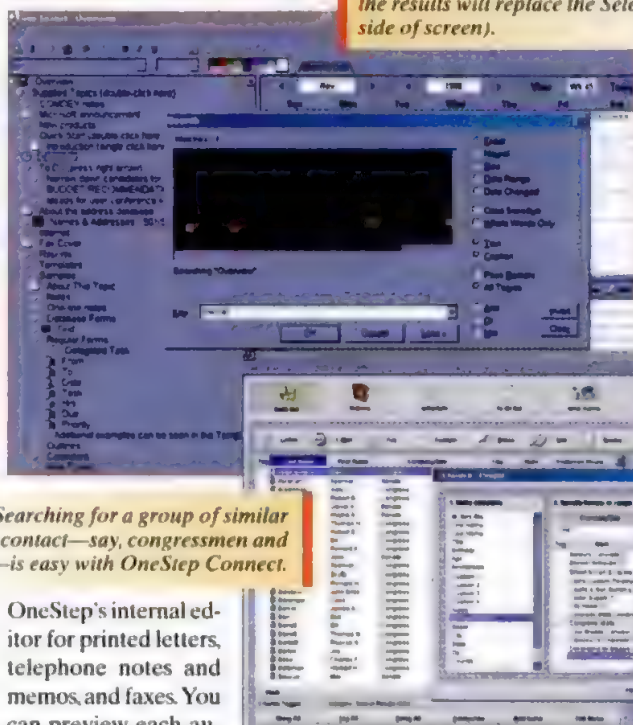
ONESTEP CONNECT 1.0

It's a pleasure to use a product as well conceived and executed as OneStep Connect 1.0 (\$49.95 list). The interface is cleaner and more usable in this first version than those of many products on their second or third renditions. OneStep's emphasis on correspondence and its simple contact-management and scheduling tools make it appropriate for home users or small businesses.

You can import an ASCII file (using an unusually comprehensible import and mapping feature) or enter your own records. The boilerplate records format holds enough fields to describe individuals adequately (name, address, four phone numbers and e-mail, and a few personal fields), with four custom fields.

The program's main screen displays a list view of contacts; four modifiable views are available. Highlight a name and tag it with a mouse click, then select the action you want from the toolbar buttons.

OneStep Connect can use either Microsoft Word 95 or 97 or



CONTACT: Searching for a group of similar people to contact—say, congressmen and senators—is easy with OneStep Connect.

OneStep's internal editor for printed letters, telephone notes and memos, and faxes. You can preview each automatically personalized document before printing or faxing and select multiple contacts for a mail merge. The same goes for e-mail; you can link to your own e-mail client for individual or mass mailings.

There's a list of custom templates for documents such as purchase orders and résumés. And you can print your database as labels, envelopes, or address/phone lists, choosing from a generous variety of formats.

OneStep Connect's scheduling and task list tools are adequate for light duty. You can set up single or recurring appointments with alarms and prioritized to-do lists. All scheduling

and task items and address book entries can be categorized to simplify searching for similar objects. A history screen displays records of correspondence and phone calls.

If your personal or business information needs are communication-heavy, don't hesitate to spend \$50 on OneStep Connect. It's an exceptionally sound PIM. **OneStep Connect 1.0.** List price:

FIND: Perform a search in Info Select and the results will replace the Selector (left side of screen).

of information you want to collect and store. You can enter bits of data here and there (such as notes from a phone conversation) and move them to the appropriate area later. This free-form approach can be very productive, but learning how to use it effectively can take time.

There are two main areas of the screen: Selector (an outline that contains icons for the program's main elements) and workspace (where your current data appears).

You can double-click on a Selector item to open it or insert a new entry, or you can use the menus or keystrokes to perform these actions. For example, you can create a note by opening the notepad with a keystroke, typing a title, entering your note, and pressing Escape to store. Later, you can

drag and drop that note into whichever category you've created for it.

Info Select 5 comes with a variety of templates—such as standard letter and fax templates, schedule and task lists, and contact record forms. None of the templates or sam-

ples is very imaginative, though.

Search capabilities in Info Select are good. Search for a word or phrase and Info Select will display the results in outline form. Info Select is a terrific idea for an information manager, but its execution doesn't fulfill that promise, and the PIM lacks the polish it should have by now. If you're willing to learn its rather complex operation, Info Select 5 might be worth your time.

Info Select 5. List price: \$99.95. Requires: 8MB RAM, 4MB hard disk space, Windows 95, 98, or NT. Micro Logic Corp., S. Hackensack, NJ; 800-342-5930, 201-342-6518; www.miclog.com; 416 at www.pcmag.com/infolink.

\$49.95. Requires: 16MB RAM, 58MB hard disk space, Microsoft Windows 95, 98, or NT 4.0. OneStep Inc., Loveland, CO; 877-622-1616; www.onestepinc.com; 415 at www.pcmag.com/infolink.

INFO SELECT 5

By contrast, Info Select 5 (\$99.95 list) doesn't have such a sleek look, though it does provide its own tools for fast data entry and retrieval. You can create schedules and track task lists, and you can enter addresses and phone numbers in very skeletal record formats.

Info Select's real forte is flexibility. You are not locked into a standard format for every scrap



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Compaq Takes Aim at Direct Vendors

Now you can order Compaq's new Prosignia line of desktops, notebooks, and servers direct, over the phone or from the vendor's Web site.

By Carol Venezia

What better place to do battle with your rivals than on their turf? This is the approach that Compaq Computer Corp. is taking with the mid-November introduction of its Prosignia line of desktops, notebooks, and servers for small businesses. You can purchase these from resellers, as you can other Compaq products; but you can also configure machines to your specifications and order them directly from Compaq via the phone or the Web.

For this roundup, we received a Prosignia Notebook 160 and a Prosignia Desktop 330. Given the focus of these systems, we decided to evaluate them by putting them up against the competition. So what follows is a face-off between these PCs and what will be their major rivals, the Dell Inspiron notebooks and Dimension desktops.

DESKTOPS GO HEAD-TO-HEAD

Comparing one vendor's non-corporate-focused desktops with another's—strictly on the basis of hardware—is a relatively easy task, as most use the same core components. And that's what we found when comparing the Prosignia Desktop 330 with a Dell Dimension XPS R450.

Both machines run on Intel 450-MHz Pentium II processors and come loaded with 128MB of SDRAM, 16MB STB Velocity 4400 graphics boards, PCI audio, PCI V.90 modems, Windows 98, and Microsoft Office 97 Small Business Edition. Not surprisingly, the PCs' performances on our ZD Business Winstone 99 and 3D WinBench tests are too close to call.

Subtle differences do exist. Whereas the Compaq PC uses a 16.8GB hard disk, the Dell can be ordered with a new 17.2GB disk. Both have speakers in

their standard configurations, but the Dimension's speakers (an Altec Lansing ACS295 system with subwoofer) have superior sound. You can, however, order the Prosignia with Altec Lansing ACS48 speakers and subwoofer for an additional \$85. Both machines are mini-

Compaq Prosignia Desktop 330. \$2,239 direct. Compaq Computer Corp., Houston; 800-888-9909; www.compaq.com/smb.

PROSIGNIA ON THE GO

Portable PCs definitely don't conform to the "one size fits all" mold of many desktops; a note-

book AC adapter is integrated, so all you have to carry is a cord—no AC brick to contend with.

What you will carry is a lot of weight and bulk. The notebook measures 2.3 by 12 by 10 inches (HWD) and weighs nearly 9 pounds, including the power cord. There are a lot of other 9-pound notebooks on the market, but this one is particularly bulky because of its height.

Within this large case, however, you'll find a fair number of leading-edge components. The Prosignia Notebook 160 that we tested came outfitted with a 300-MHz mobile Pentium II processor and 64MB of memory, plus the aforementioned CD-ROM drive and hard disk. The front-mounted floppy disk drive fits into what Compaq calls a Multi-bay; this bay can also house an LS-120 drive, an Iomega Zip Drive, a second hard disk, or a second battery.

DIRECT HIT: The Prosignia Notebook 160 (left) and the Desktop 330 are ideal machines for small businesses.

Flip open the lid, and you'll discover a 14.1-inch active-matrix display (12.1- and 13.3-inch displays are also available on some models). But though this panel's quality is impressive, we found the graphics subsystem lacking. The PC has only 2MB of display memory, so its maximum color depth at its top resolution of 1,024 by 768 is 16-bit.

The Prosignia Notebook's keyboard is impressive, providing ample travel and a firm but not stiff response. Four easy-access keys above the keyboard and to the left can be programmed to launch applications. Integrated into the wrist rest are a touch pad and stereo speakers, but the positioning of both is awkward. The touch pad is placed dead-center, and the speakers are placed so that your wrists sit on top of them while you're typing.

The rest of the notebook's components are standard fare. Headphone and microphone jacks and hardware volume con-



towers, but the Prosignia can be reconfigured as a desktop; the Dimension, on the other hand, provides easier internal access via a single thumbscrew.

The Prosignia may be a better choice for small businesses concerned with manageability. Prosignias are all DMI 2.0-compliant, and they can be ordered with Wake on LAN-capable fast Ethernet cards. Dimension PCs are not DMI-compliant; they have NIC options but not WOL-capable NICs.

Pricing is close, however. The Prosignia, with the above components plus a 40X CD-ROM drive and a 17-inch monitor, costs \$2,239. A near-identical Dimension is about the same price.

book purchase can be a personal decision based on computing habits. So although the Compaq Prosignia Notebook 160 and the new Dell Inspiron 3500 are aimed at small-business customers, they are very different.

If convenience is what you're after—meaning that you don't want to carry a lot of spare parts around—the all-in-one design of the Prosignia Notebook 160 may be just the ticket. There's a tradeoff: This notebook is big.

The Prosignia Notebook is a three-spindle machine, meaning that the floppy disk drive, 24X CD-ROM drive, and 6GB hard disk can be housed in the notebook simultaneously. As an added convenience, the system's

trol are found on the left, and two stacked PC Cards, a USB port, and an RJ-11 jack for the machine's integrated 56K modem are on the right.

The model we tested costs \$2,999; with DVD instead of CD-ROM, it costs an extra \$199 (this includes a Margi DVD-to-Go PC Card, which handles MPEG-2 and AC3 decode). A Zip Drive costs an extra \$189, an LS-120 is \$179, and a second battery is \$129. Like the Prosignia Desktop 330, this notebook is fully manageable.

Compaq Prosignia Notebook 160. \$2,999 direct. Compaq Computer Corp., Houston; 800-888-9909; www.compaq.com/smb.

THE CHALLENGER: INSPIRON

The new Dell Inspiron 3500 notebook integrates many of the same components as the Prosignia Notebook 160 does, but in a much slimmer package. Though the Dell machine's footprint is identical to the Prosignia's, the Dell is significantly thinner, at just 1.5 inches high.

The Inspiron is also lighter,

weighing 7.5 pounds with AC adapter. Keep in mind that the Prosignia's weight includes the floppy disk drive; because the Inspiron is not a three-spindle design, add about half a pound for whichever spare drive you choose to carry, if any (we weighed our test machine with its DVD drive).

Like the Prosignia, the Inspiron features a 300-MHz Pentium II CPU, 64MB of RAM, and Windows 98. Our test machine was outfitted with a 2X DVD drive and a Margi DVD-to-Go PC Card, as well as a 6.4GB hard disk. The Inspiron costs just a bit more than the Prosignia Note-

LEAN MACHINE: At 1.5 inches high, the Dell Inspiron 3500 notebook is slimmer than its Prosignia counterpart.



book, at \$3,297 direct.

The Inspiron also has modular bays located up front: The left bay can hold either a DVD drive, 24X CD-ROM drive, floppy disk drive, Zip Drive, or second battery, and there's a battery bay on the right. Swapping components is easier with this machine than with the Prosignia:

Just pull a small tab on the side of the machine forward and then out to the side, and whatever's inside the bay pops out.

The portable Dell has a 14.1-inch display driven by a NeoMagic 256AV 66-MHz AGP chip set. The subsystem also incorporates 2.5MB of SGRAM, so the notebook will support 24-bit color at 1,024-by-768.

Like the Prosignia, the Inspiron has a full-size keyboard and a touch pad, although on this portable, the latter device is properly positioned slightly left of center on the wrist rest. The left side of the machine houses a keyboard/mouse port and a

USB port; on the right side, you'll find headphone, microphone, and line-in jacks, as well as two stacked PC Card slots.

Speaker volume is controlled by function keys; we preferred the Prosignia's dedicated-button approach. We liked the Inspiron's speakers better, however. They're set into the palm rest on either side, but the grilles are located on the side vertical edges of the notebook, so sound fires unmuffled out to the sides.

Both the Inspiron and Prosignia turned in comparable scores on our BatteryMark test; the former ran for 2 hours, 42 minutes, and the latter lasted 2:47. On our ZD Business Winstone 99 test, though, the Inspiron's score topped the Prosignia's by about 11 percent.

Like the Dell Dimension desktops, the Inspiron is not DMI-compliant; for a manageable, standards-compliant PC from Dell, look to OptiPlex desktops or Latitude notebooks. **Dell Inspiron 3500.** \$3,297 direct. Dell Computer Corp., Austin, TX; 800-388-8542; www.dell.com/products/notebook/inspiron; 414 at www.pcmag.com/infmlink.

Compaq Online: At Your Service

Compaq has partnered with third parties to develop a set of services that complement its new Prosignia desktops and notebooks. Compaq Online Services is a suite of Internet-enabled tools that not only allow small businesses to work more effectively but also to compete on equal footing online with larger rivals. The four services in this suite are online backup, online.briefcase, online.commerce, and online.delivery. Software that enables the services comes preloaded on all Prosignia machines; services can be purchased individually or bundled for a reduced price.

Online.backup uses NovaStor software to allow Prosignia customers to back up and restore their data over the Internet or to a server, from any location on the net—

work. Online.briefcase is actually Visto's popular

Briefcase product, a Web-based remote-access solution that includes e-mail, calendaring, and address-book functions. Online.commerce is Com-

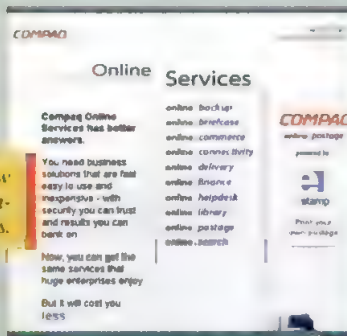
paq shorthand for INEX Commerce Court Publisher, an e-commerce tool you can use to create a Web storefront featuring up to 500 products from your company's catalog.

Online.delivery is two services: e-Parcel and UPS Online Courier. The former lets you deliver large files quickly and securely over the Internet, with optional copyright protection; the latter lets you deliver business documents and information over the Internet securely. With Online Courier, you can

track your online deliveries and verify that they've been received, and you can easily encrypt or pass-protect the information.

Hardware alone is no longer a product differentiator: The services companies deliver to their customers are what can make or break a buying decision. With its extensive portfolio of online services, Compaq is giving the right customer a great reason to buy Prosignia. —CV

EQUAL GROUND: Compaq's new online services give you reasons to buy Prosignia products.





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Diagnose What Ails Your PC

TouchStone Software's new suite can help find and fix PC problems.

By Kathy Yakal

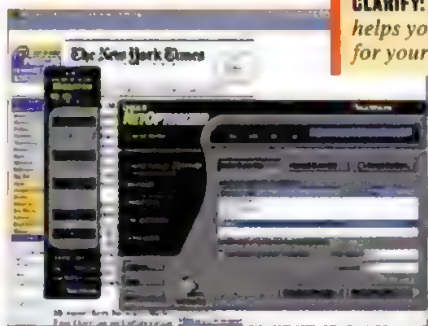
The more things change, the harder they are to fix. As Windows grows more and more complex, the need for diagnostic tools increases. Enter CheckIt 98 Diagnostic Suite (\$130 street), the latest product applying to be your PC's mechanic.

Unlike programs such as Norton Utilities and Nuts & Bolts, CheckIt emphasizes diagnostics and treatment for hardware rather than software. CheckIt's components test your PC's drives, motherboard, and other devices for critical problems.

One option is a Y2K-compliance test. As with other problems, CheckIt was able to evalu-

ate the situation for us and correct it (fixing our faulty CMOS/real-time clock active-support error).

But programs like CheckIt have limitations; in this



CLARIFY: CheckIt NetOptimizer helps you find the optimal settings for your Internet connections.

case, it couldn't do anything about two-digit date fields in software applications. What it can do is give your hardware a good checkup and either recommend solutions, provide them,

or remind you to run existing Windows tools such as ScanDisk regularly.

CheckIt 98 alone is probably enough for the average user who wants more than Windows system tools provide. But the suite is recommended for the professional technician who will likely be working on more

than one machine.

The suite contains additional firepower, such as portable DOS diagnostics to help dig into an ailing system when Windows won't boot. FastMove!, a file-transfer/synchronization program, sim-

plifies the relocation of files to a new PC. Also included are loop-back plugs for testing parallel and serial ports, and a parallel file-transfer cable.

You also get CheckIt Net-

Optimizer, a LAN administrator for those still whimpering about dial-up connections. NetOptimizer makes anywhere from four to seven test passes, connecting to your ISP using different settings to find an optimal connection.

While you're connected, you can pop up the Internet Monitor, a floating window that displays your current download speed, the time required to download a 1MB file, and the total time you've spent online.

Anyone who diagnoses and repairs PCs for a living should seriously consider this suite of tools. If you're a casual user, the core product—CheckIt 98—would be a better choice. **CheckIt 98 Diagnostic Suite.** Street price: \$130. Requires: DOS or Microsoft Windows 95 or 98, 25MB hard disk space. TouchStone Software Corp., Huntington Beach, CA; 714-969-7746; www.checkit.com; 400 at www.pcmag.com/infolink.

Better Translation

Need to communicate across borders? Globalink's new program helps remove language barriers.

By Greg Alwang

When you do business with international customers, Globalink Power Translator Pro 6.4 can let you truly speak their language. Power Translator (\$149.95 list) is a full-featured language translator that works with text in documents, e-mail, and Web pages. Globalink, a subsidiary of Lernout & Hauspie (L&H) uses its Barcelona translation engine to support translations to and from English and French, German, Italian, Portuguese, or Spanish.

Power Translator includes a standalone translator module with a two-paneled window: Source text goes in the top pane and translated text appears in the bottom. The product supports HTML, RTF, and text files, and you can type or cut-and-paste text from another applica-

tion into the source pane.

You can translate one sentence at a time or an entire document. An interactive mode lets you fine-tune the translation by substituting alternatives for translated words on the fly.

To improve translation accuracy further, Power Translator uses high-end linguistic rules and algorithms. In addition to general language dictionaries, the program includes over 30 industry-specific dictionaries for each language, including banking and medical. You can edit any of the dictionaries and add literal translations for specific words or phrases. These features, coupled with the fact that text is translated in the context of entire sen-

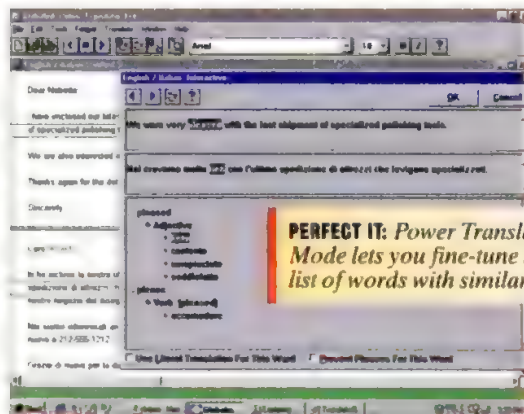
tences, result in very effective draft translations.

A Translation Utility module integrates with Microsoft Word, Corel WordPerfect, and several e-mail packages, including Lotus Notes Mail and Microsoft Mail, Exchange, and Outlook. This lets you create correspondence in fa-

your browser while maintaining formatting and hyperlinks. You can toggle between the original and translated versions of the Web page, and the last eight translations are saved, so they don't need to be retranslated.

Power Translator is popular with customer service and techni-

cal support departments of firms that have international customers, but it's also easy enough for individuals to use. L&H plans to add



PERFECT IT: Power Translator's Interactive Mode lets you fine-tune by selecting from a list of words with similar meanings.

miliar applications and translate with the press of a button.

The Web Translator module works with Internet Explorer and Netscape Navigator, translating the current Web page in

support for several more languages, including Japanese, Chinese, Russian, Korean, and Arabic.

Globalink Power Translator Pro 6.4. List price: \$149.95. L&H/Globalink, Burlington, MA; 781-203-5000; www.lhs.com; 407 at www.pcmag.com/infolink.

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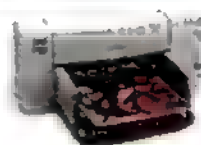
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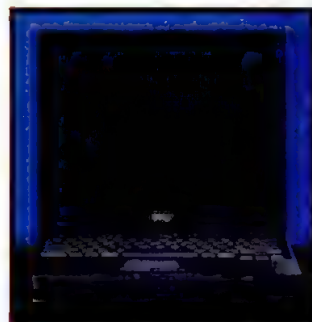


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- Deluxe Nylon Case
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To see who else is deploying Microsoft SQL Server 7.0 in their enterprise go to www.microsoft.com/sql/



Mathcad Adds Power

Mathcad Professional 8 adds encapsulated OLE automation and superb 3-D graphics.

By Barry Simon

MathSoft's Mathcad has long represented the model of simplicity in mathematical software. Mathcad Professional 8 (\$499.95 list; a \$99.95 Standard version is also available) includes new mathematical tools, the ability to use OLE automation with little or no programming, and a new graphics engine.

Mathcad includes a VBScript-based macro language. One of this language's main uses is to pass data back and forth using OLE automation, an attractive feature. If the OLE automation is needed only to interchange variables, and if the second program is one from a specific list, then no programming is required. This is because Mathcad has controls that encapsulate the script needed to pass variables; you have only to fill in some placeholders.

Programs that are encapsulated are Axum, Excel, File Read/Write, Data Tables, MatLab, and S-Plus. There is also a generic control that encapsulates the Mathcad side but requires you to write code in the target program's language. The code is reusable, so MathSoft can then add it to the supported list.

The ho-hum 3-D graphics in earlier versions have been totally redone. The new engine is OpenGL-based and allows multiple graphs with transparency, multiple lighting sources, color maps, and projected contours.

There are also some new mathematical elements. Numerical integration techniques permit the calculation of integrals on infinite domains as well as at integrable singularities. Nonlinear optimizers have been added to Mathcad's set of solution and optimization

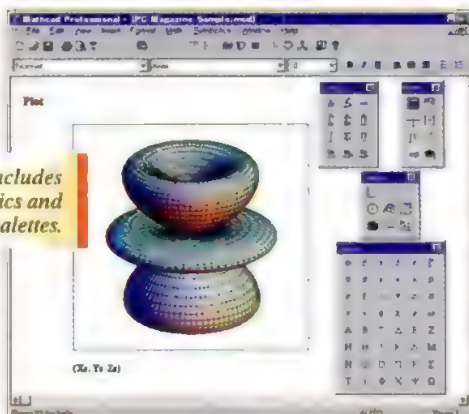
tools. Algorithms have been added that attempt to choose among numerical integration or optimization methods. Overriding the built-in choice is as easy as right-clicking and

NEW MATH: Mathcad includes impressive 3-D graphics and floating tool palettes.

choosing from a menu.

Mathcad could always produce documents with text, mathematical symbols, and graphics. But this version includes

stylesheets, bullets, numbered lists, headers and footers, and a spell-checker. Of course, all the things that made Mathcad a standard are still here: instant recalculation, hundreds of mathematical functions, and a friendly interface.



We'd like to see Mathcad use VBA in place of VBScript because of VBScript's flexible IDE. And we hope that MathSoft expands the programs accessible via fully encapsulated OLE to include Visio and some CAD programs. This impressive upgrade will be attractive to those who need mathematical tools.

Mathcad Professional 8. List price: \$499.95. Requires: 16MB RAM, 30MB hard disk space, Microsoft Windows 95, 98, or NT 4.0. MathSoft Inc., Cambridge, MA; 800-628-4223; www.mathsoft.com; 408 at www.pcmag.com/infolink.

Online Basic Training

Easily create interactive training sessions to deliver over a network or the Web with ToolBook II.

By Daniel Grotta and Sally Wiener Grotta

Designed for content experts rather than code experts, ToolBook II Assistant 6.5 (\$1,095 list), lets corporations and organizations create lessons to be shared over a network or the Web.

The software's lessons are developed as screen-based "books." Version 6.5 provides various editable templates for sales skills training, business training, quizzes, handbooks, and so on.

Once you choose your template (or develop a customized one using the Book Specialist wizard), you place your con-

tent using drag-and-drop objects. The objects library includes interactive questions, video and audio players, pictures, bulleted lists, headlines, HTML or Java placeholders, and interactive targets.

The interactive questions and targets generate scores that can be displayed in evaluation objects. An object can be defined as a hot link to other pages in the book or to any Web site. When you're finished, you can save your book as a template, as well as save any customized objects to the catalog.

ToolBook uses familiar Win-

dos conventions. Anyone comfortable with creating PowerPoint presentations will have no difficulty working with ToolBook.

Output is Wizard-driven, automatically packaging the book for its destination—the Internet, intranet, or LAN, or for distribution on a CD-ROM or floppy disk. Your lesson can be output in its native format (TBK) as an HTML file with embedded Java applets or as a runtime application. It can also be published to Librarian, Asymetrix's server-based system for managing courses.

Books can also be set up to e-mail users' scores automatically to Librarian, the administrator, the student, and/or a specified e-mail address. Similarly, a log of users can be sent to the administrator, Librarian, and/or a specified e-mail address.

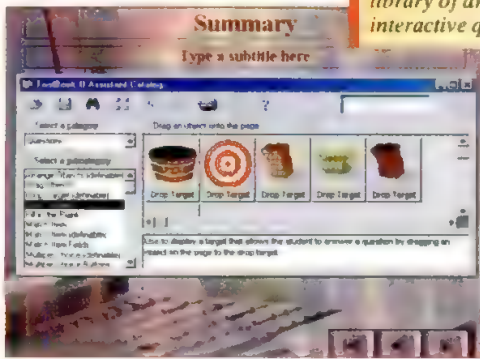
As a template-based courseware-authoring program, ToolBook II Assistant 6.5 has made it easy to develop powerful on-

line lessons, interactive catalogs, presentations, and manuals. Just as important, the feedback and

scores generated let you gauge their effectiveness.

ToolBook II Assistant 6.5. List price: \$1,095; upgrade, \$295. Requires: 16MB RAM, 60MB hard disk space, Microsoft Windows 3.1, 95, 98, or NT 3.5 or later. Asymetrix Learning Systems Inc., Bellevue, WA; 800-448-6543; www.asymetrix.com; 409 at www.pcmag.com/infolink.

Q & A: ToolBook II Assistant's sizable library of drag-and-drop objects includes interactive questions and targets.



downs conventions. Anyone comfortable with creating PowerPoint presentations will have no difficulty working with ToolBook.

Output is Wizard-driven, automatically packaging the book for its des-

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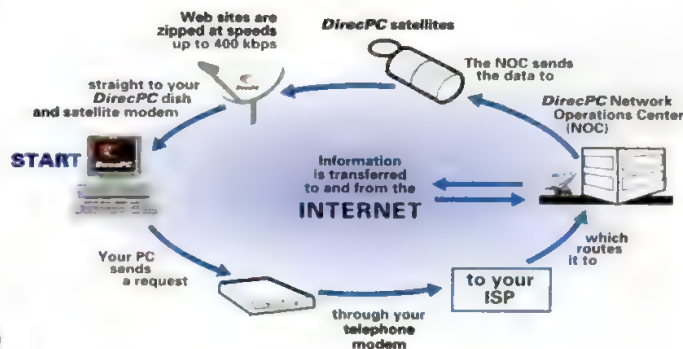
If you've been holding out for the cable or telephone company to bring high-speed Internet access to your neighborhood, chances are it's been a while. Which is a shame, because if you'd chosen DirecPC, you could be surfing at up to 400 Kbps **right now**. That's up to 14 times faster than a standard 28.8 modem and almost three times faster than an ISDN line.

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The engineers at Hughes figured out that the real bottleneck in the speed of the Internet wasn't the request **out** to the Web — telephone modems handle that just fine. Everything slows down when the Web tries to use the telephone system to send you **back** the media-rich information you requested. So, we use a much faster satellite connection for sending you the Web content you want. Check out the diagram — this is the system that makes DirecPC the fastest Internet access available nationwide.



[illegible]

Notable Progress

The smaller, lighter CrossPad XP makes jotting down notes more productive.

By Carol A. Mangis

Everyone has times—say, in client meetings, school, or training sessions—when it's easier to take notes the old-fashioned way, with pen and paper. You still might want to save those notes on your PC, though. The Cross Pen Computing Group, which gave us the CrossPad earlier this year (see our issue of July, 1998), has made it easier to do just that. Now available is the CrossPad XP, a smaller, lighter, improved version of the original CrossPad.

The CrossPad XP is a 11.9- by 7.8- by 0.9-inch device with a 6- by 9-inch paper pad sitting on top. At only 1.5 pounds, it's more portable than the original

CrossPad and easier to hold, but it works the same way.

You write your notes on the paper pad with the supplied CrossWriter pen; while you scribble in ink, the notes are digitally transferred to the XP via a radio transmitter in the pen. Later, you upload the notes to your PC through a supplied serial cable. They're saved in a proprietary file format, INK, via Cross's Ink Manager program.

Setup is fairly straightforward; you can see your handwriting transferred to the screen within minutes. This is handy for those who tend to illustrate their notes and want them stored as they were written. If you want the program to convert your writing

to text, you'll need to go through about 2 hours of recognition training.

The company has made some helpful changes. For one, there's a snap-in holder for the easier-to-use pen. Thumbnail views of your notebook are now available, making organizing and sorting your stored notes easier.

You can save your notes in formats other than INK, such as BMP, JPEG, and TIFF. And you can now e-mail files you've created, even to users who don't have Ink Manager. The CrossPad software development kit (a free download from www.research.ibm.com/electricInk) lets you customize forms and applications.

The XP still has only 1MB of flash ROM storage, and there's no way to add more. And you

TAKE NOTE: The CrossPad XP digital notepad.



have to remember to tell the device that you're flipping to a new page or that you're turning back to append something to a previous page. Even so, the CrossPad XP is easy and fun to use and is a handy tool for inveterate jotters.

CrossPad XP. List price: \$399. Requires: 16MB RAM (32MB for Windows NT), 50MB hard disk space, Microsoft Windows 95, 98, or NT 4.0. A.T. Cross Co., Cross Pen Computing Group, Lincoln, RI; 800-510-9660, 401-333-1200; www.cross-pcg.com; 413 at www.pcmag.com/infolink.

Easy 3-D for Your Site

Platinum Cosmo PageFX uses the open VRML97 format to deliver 3-D graphics and animation.

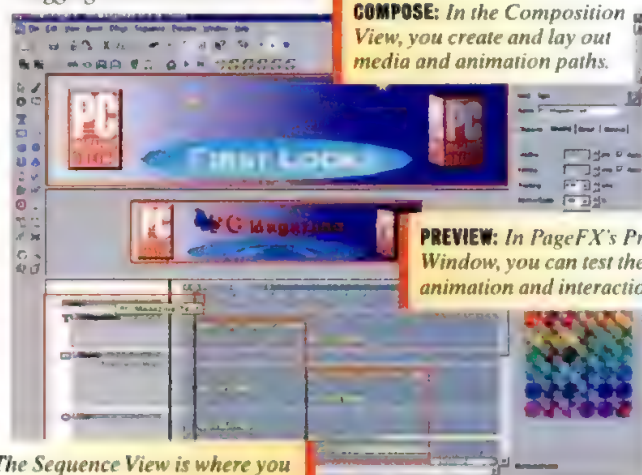
By Linda Von Schweber

Platinum Cosmo PageFX 1.0 is the first product we've seen that provides Web designers with a single tool for producing interactive animations and site navigation using 2-D vector and bitmap graphics, 3-D primitives, imported 3-D objects, 2-D and 3-D animated effects, 2-D and 3-D text, and drag-and-drop behaviors that follow easily defined logic without scripting.

Since PageFX (\$129 direct) uses the resolution-independent VRML97 format, file sizes are tiny compared to GIF animations, and the interaction capabilities are unique. PageFX is well suited to creating navigation frames, ad banners, and gamelike sites.

PageFX simplifies working with 3-D by setting up a single still-camera position. In a matter of minutes we were able to create a 3-D spinning logo

from an imported 2-D PC Magazine bitmap by applying it to the sides of a cube, selecting spin from the Effects Palette, and dragging its start behavior to the



COMPOSE: In the Composition View, you create and lay out media and animation paths.

PREVIEW: In PageFX's Preview Window, you can test the animation and interaction.

ORDER: The Sequence View is where you drag and drop and organize behaviors, set up logic, and establish timing.

mouseover trigger on the Sequence View timeline.

We were able to set 2-D and 3-D text professionally, selecting

fonts and size and setting leading, kerning, tracking, bevel, extrusion, and more. Text can be animated in 2-D and 3-D as blocks, words, or letters.

PageFX makes it easy to produce animated eye candy and navigation buttons. Any of the 43 effects can occur for a set or ran-

domized number of seconds triggered on start up, periodically, by another effect, or by a user action.

spond to a mouseover by highlighting, changing color, spinning, and making a sound. On a mouse click, the button can follow the user's mouse around the screen while it loads multiple HTML pages into frames.

Logic elements let you produce a gamelike interface without scripting. You can even produce a toggle switch or use an AND logic element, for example, to pop up a new navigation button to a white paper, only after your viewer has clicked all the required links.

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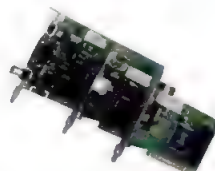


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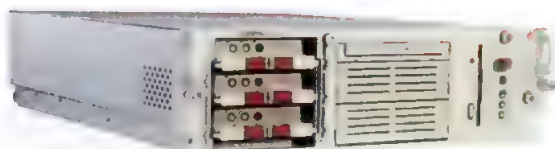
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Affordable, Stylin' Portable

IBM's new ThinkPad i Series proves that budget notebooks needn't be clunky and underpowered.

By Carol Venezia

Do you think that all consumer-oriented, low-priced notebooks are big, ugly boxes filled with compromises and yesterday's technology? Then you owe it to yourself to check out IBM's new ThinkPad i Series. These notebooks were designed from the get-go with the needs of individuals (thus, "i" Series) in mind—particularly students, small-business people, and families. And best of all, prices start at just \$1,500; we looked at the \$2,000 Model 1450.

At first glance, this ThinkPad doesn't look like a near-8-pound notebook that measures 2 by 13 by 10 inches (HWD). That's because IBM designed it with sleek, beveled edges around the base, so when the notebook is open, it appears to be an inch-thick device that's hovering slightly above your desktop.

But don't let the stylish exterior fool you: Under the hood is a serious PC. The 1450 comes equipped with a 266-MHz Pentium/MMX CPU, a 13.1-inch XGA active-matrix display, 64MB of RAM, a 4.3GB hard

disk, and an integrated 56K modem. And although the system uses a nickel hydride battery instead of a lithium, it lasted 3 hours 15 minutes on our BatteryMark test.

The slickest feature of this notebook, however, is its multimedia subsystem. The 1450 has a three-spindle design, so the floppy disk drive and 20X CD-ROM drive are both built into the notebook. To augment the CD-ROM drive, there are CD controls built into the front

of the machine (forward, reverse, stop, and play), plus a headphone, a microphone, line-out jacks, and a volume-control thumb-wheel on the left



THE BEST: The i Series notebooks are serious consumer PCs.

side of the box. Through IBM's Instant Audio feature, you can play music CDs when the system is shut off and closed.

Also, the unit's side-mounted Altec Lansing SoundGuide stereo speakers produce outstanding sound for a portable, quite possibly the best we've ever heard.

IBM also went the extra mile for the i Series' keyboard. Like those of all ThinkPads, it's firm and responsive without being stiff, and you can program four of the function keys to launch your favorite applications. You also get the familiar red TrackPoint pointing device, along with what IBM calls the Internet Scroll Bar, a third mouse button you can use to scroll through long documents or Web pages. A minor quibble: The 4-inch-deep wrist rest is almost too expansive. We recommend removing your watch, or your typing experience may be somewhat awkward.

To complete the package, IBM bundles Lotus SmartSuite Millennium, Quicken 98 SE, Norton AntiVirus, and WorldBook Multimedia Encyclopedia, plus 100 hours of free Internet access through America Online.

Our suggestion to IBM? Build these machines as fast as you can, because they're the most impressive consumer notebooks we've ever seen.

IBM ThinkPad i Series, Model 1450. Street price: \$2,000. IBM Personal Systems Group, Somers, NY; 800-426-7255; www.pc.ibm.com/us/tp/series. 410 at www.pcmag.com/infolink.

Wireless Connectivity

The versatile Novatel Sage Wireless IP Modem connects to just about any computer you need it to.

By Bruce Brown

Novatel Wireless has recently brought to market its most accessible wireless Cellular Digital Packet Data (CDPD) IP modem. The external Sage Wireless IP Modem (\$400 street) can connect via serial port to desktop PCs, notebooks, and PDAs, saving money and reducing hassle for people who use multiple devices. With support for Windows 3.1, 95, 98, NT, and CE and Palm OS, the Sage works wherever you are, with whatever device you're carrying.

The downside is that you need to carry the Sage along with your portable computer or PDA. At 12.6 ounces with a standard nickel hydride battery pack installed and measuring 1.4 by 6.5 by 3.8 inches (HWD), this modem isn't tiny.

You have other choices. 3Com Palm device users can opt for a Novatel Minstrel, which encases the PDA. For Windows CE communications, consider Novatel's

Contact!, a H/PC 2.0 device with both an internal wired and an internal wireless modem. But since the Sage works with all of those devices and more, it's an ideal choice for users and companies that employ various types of portables.

The Sage is a 19.2-Kbps, full-



duplex, AT-command-set modem, with built-in TCP/IP, UDP, and SLIP protocols. Although the modem's speed can't compete with the throughput of 56K, ISDN, or cable modems, it's fine for e-mail and on-the-go information access.

LED indicators on the Sage

show wireless service, transmission, reception, power, and charging status. When you sign up for wireless service, the Sage is assigned an IP address. You use Novatel's easy-to-install OPCenter software to connect with the CDPD network.

Because the Sage is a CDPD modem, it requires a service plan account. Major service providers, such as AT&T and Bell Atlantic, sell the Sage with a service plan, often at significant discount, as they do with cellular phones. Not all parts of the U.S. currently have CDPD coverage; Novatel's Web site (www.novatel.com) has information on provider coverage.

As companies increase the variety of portable devices they use, and accessing the Internet is possible from anywhere, the Sage may prove a handy solution.

Novatel Sage Wireless IP Modem. Street price: \$400. Requires: 9-pin serial port; Windows 3.1, 95, 98, NT, CE, or Palm OS; CDPD wireless IP network service plan. Novatel Wireless Inc., San Diego; 888-888-9231, 619-784-0620; www.novatelwireless.com; 411 at www.pcmag.com/infolink.



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Enterprise Design Power

Developers, engineers, and administrators will all use Visio Enterprise 5.0's new interactive tools.

By Robert P. Lipschutz

Visio Enterprise 5.0 (\$995 list) strives to incorporate earlier product Visio Professional's (\$349 list) drawing features with a slew of new interactive tools for the network administrator, database administrator, and software developer. The result is an active modeling tool that makes documenting your plans, ideas, and diagrams simpler.

New tools, such as network auto-discovery and database schema extraction, make creating documentation easier, while others like Novell's NDS wizard and the database validation wizard guide you through complex processes.

Network administrators can use the new Auto-discovery tool to find and import routers, servers, desktops, and other devices into Visio drawings. Visio starts with the nearest router and uses the router's tables to find other equipment in the network. This technique will find most devices, but you will undoubtedly need to add some hubs and other devices manually.

Visio also includes the entire Visio Network Equipment library, a collection of vendor-specific device shapes, so your documentation will have a realistic appearance.

Finally, you can interact with Novell's NetWare Directory Service (NDS) to document, modify, and update your NDS organizational tree.

Of all of Visio's target consumers, database administrators may be the most satisfied. The schema extraction tool aids in pulling the tables, table relationships, and even the stored procedures and triggers, from the most common databases including Microsoft Access, Microsoft SQL Server, and Oracle. We pulled in a schema from a Mi-

crosoft Access database, added a few new tables and fields, then updated the database with our modified schema. We completed the tasks with little hassle.

Visio also features many useful diagramming models for software designers, including nine different diagram types from the Object Management Group's UML 1.2 specification. Microsoft Visual C++ and Visual Basic users can automatically document their code using the macros that integrate right into these development tools.

With all these new features,

it's easy to forget about Visio's many custom shapes, connectors, and drawing tools, which are useful for the creation of detailed technical documentation. Related shapes are collected into stencils which are included in templates for various disciplines such as software or database design. You can customize your environment by creating your own shapes, stencils,

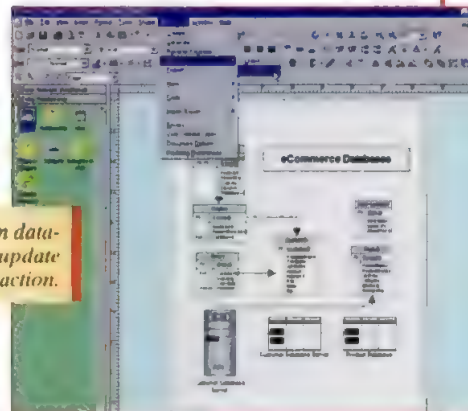
EXTRACT: Pull tables from databases, add fields, and update schemata with Visio's extraction.

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municating, or software development, Visio Enterprise 5.0 has you covered.

Visio Enterprise 5.0. List price: \$995. Visio Corp., Seattle; 206-521-4500; www.visio.com; 406 at www.pcmag.com/infolink.



Wireless Catches Up

Aironet's 4800 Turbo DS Series 11 Mbps matches wired Ethernet network speeds.

By Jeffrey Witt

Detractors of wireless networking have noted performance shortfalls compared with wired networks. Aironet's 4800 Turbo DS Series 11 Mbps-rated products blow the speed objection off the table by matching the throughput of 10-Mbps Ethernet networks. Packaged in a PC Card, the product uses Radio Frequency (RF) technology and leaves you free to run any application unattached.

Aironet has broken down the performance barrier, but cost-wise, the PC4800 adapter (\$795 list) and the AP4800 wireless bridge (\$1,995 list) haven't hit throw-away prices. New installations should weigh this against the labor cost of installing a wiring infrastructure, however. Aironet also claims backward compatibility with its existing products at

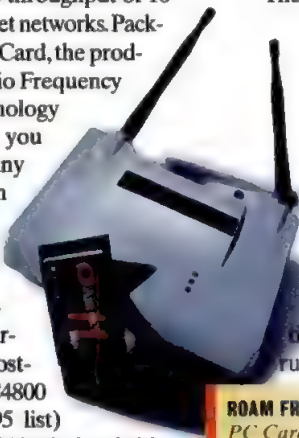
slower speeds and interoperability with any IEEE 802.11-based device at 1 and 2 Mbps.

We installed the PC4800 card into an IBM ThinkPad 560E without incident. To talk to our wired test network, we used the modem-size AP4800 bridge.

The bridge connects like any piece of cabled networking equipment and then accepts radio signals from your portable. The PC4800's antenna is a small, snap-on device that protrudes an inch from your notebook.

To get things operational, you'll need to run a terminal program

ROAM FREE: Aironet's wireless PC Card and bridge let you compute without wires.



like Windows HyperTerminal via a serial cable to the AP4800 and assign a name and IP address. After the initial setup, the bridge is manageable via a browser from virtually any loca-

tion that has access to the network, as well traditional Telenet and SNMP consoles. Within the properties of the PC4800 adapter, you need merely to enter the name of the bridge to become a client on the network. To run completely wireless, a peer-to-peer network can run from adapter to adapter without the bridging equipment.

To test Aironet's performance claims, we ran FTP file transfers of text files from our Windows NT 4.0 Server and saw transfer rates of 6 Mbps. Wireless results matched numbers we generated running the same test from a desktop on the cabled portion of our network. We've only seen similar performance from one other wireless system—the RadioLAN/10, which requires a large antenna and is proprietary. Using Aironet's direct sequence spread spectrum technology running in the 2.4-GHz frequency band, the system has an effective indoor range of 100 feet and 500 feet in open spaces.

Aironet 4800 Turbo DS Series 11 Mbps. List price: PC4800 adapter, \$795; AP4800 bridge, \$1,995. Aironet Wireless Communications Inc., Akron, Ohio; 330-664-7900; www.aironet.com; 405 at www.pcmag.com/infolink.

Making the Connection

The 3Com OfficeConnect 56K LAN Modem offers fast, multi-PC Internet access.

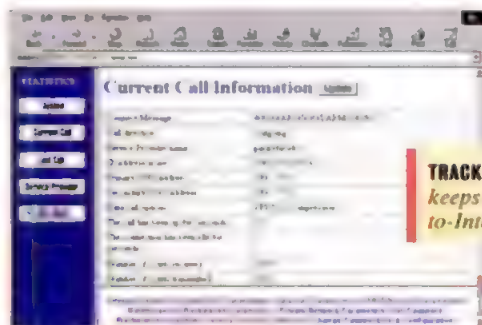
By Les Freed

The new 3Com OfficeConnect 56K LAN Modem (\$280 street) provides speedy Internet access for up to ten users on your LAN, using a single dial-up ISP account and a standard POTS phone line. The 56K LAN Modem also includes a four-port 10Base-T hub, making it a good solution for multi-PC home and small office users.

Until recently, most LAN-to-Internet access-sharing devices required an ISDN line. ISDN is still expensive or unavailable in some markets. But 56K V.90 Internet access is available nearly nationwide, and V.90 provides near-ISDN speeds over ordinary analog phone lines.

The 56K LAN Modem comes in the same styled plastic case as the other products in the OfficeConnect line. Rear-panel connectors provide access to four 10Base-T LAN ports, a phone line connector (with a pass-through for a phone or fax machine), the power connector, and a recessed reset button. The front panel has combination status and traffic LEDs, the Ethernet ports, and send and receive data LEDs for the built-in modem.

A fold-out quick-start guide contains all the information you need to get up and running, and a more detailed manual is provided on the included CD-ROM. For our test setup, we connected the cables to the phone line and test PCs, and we started a Web browser on one of the PCs. We were immediately presented with the 56K LAN Modem's browser-based configuration screen. A first-time installation wizard asked for our ISP phone number and account information, and 10 minutes later we were connected to the Internet.



addresses on the LAN, and additionally communicates with the ISP using a single, dynamically assigned IP address. This means you don't need a dedicated

(read expensive) router account with your ISP and you don't have to assign fixed IP addresses to

TRACK IT: Web-based software keeps track of all your LAN-to-Internet details.

each of your PCs.

Our test 56K LAN Modem provided very fast V.90 connections, averaging around 50 Kbps per connection. The 56K LAN Modem can use LZS data compression. With compression enabled, the LAN Modem achieved down-

load speeds of over 100 Kbps when transferring text files.

Like all V.90 modems, the 56K LAN Modem took a considerable amount of time—often 20 seconds or more—to negotiate an initial connection with our test ISPs. By comparison, the 3Com ISDN LAN Modem connected to the same ISP in less than 3 seconds.

Like all OfficeConnect products, the 56K LAN Modem has a limited lifetime warranty. The LAN modem comes with two CD-ROMs containing detailed product documentation and additional software.

3Com OfficeConnect 56K LAN Modem. Street price: \$280. 3Com Corp., Santa Clara, CA; 800-638 3266; www.3com.com; 404 at www.pcmag.com/infolink.

Network Power Printing

Speed up, manage, and protect your workgroup print jobs with the HP LaserJet 8100.

By Steve Rigney

The HP LaserJet 8100 is not just a big laser jet printer, although at around 150 pounds, that may be your first impression. The 8100's 32-ppm speed, built-in network print server, and complete remote manageability make it much more. Distinguishing features include the ability to print a proof copy, print directly from the printer, use an infrared connection, make copies, and control jobs using a basic Web browser. All of this functionality will cost you; you'll pay around \$3,295 (list) for the model with built-in networking and 24MB of RAM.

The 8100 is designed to service the large workgroup, and it accomplishes this with an NEC 166-MHz processor that can handle up to 150,000 pages a month at 1,200 dpi. The three paper trays can handle 3,000 sheets, and the built-in letter gauge will alert the administrator if the trays are almost empty. The 8100 also has a toner gauge to monitor usage and assist you in

deciding when to purchase new supplies. Each toner can handle up to around 20,000 pages, which gives the 8100 an average cost of about 9 cents per printed page.

Some of the rarer—and welcome—features of the 8100 are proof and hold, private printing,



WIRELESS: The 8100 has an IR port.

stored jobs, and quick copies. We tested the proof feature by sending 30 copies of a document to the 8100. From the printer console, we were able to print a single copy of the document, review the copy, and then choose to complete the job or delete it. The private printing feature lets you

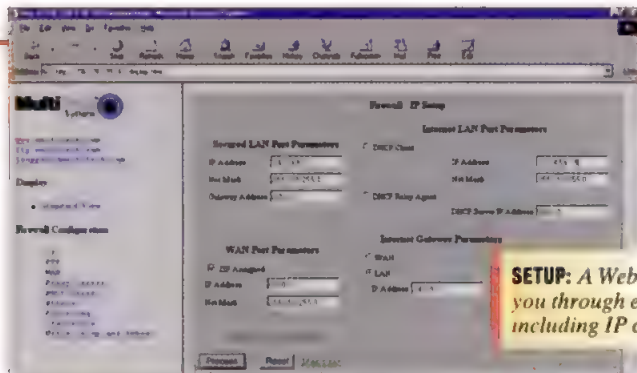
assign a PIN to the 8100 so users cannot retrieve their jobs unless they type in their correct PINs on the printer's console. Likewise, the optional hard disk lets you store entire jobs in the printer for later retrieval. The quick copy feature let us print up to 999 copies of a document that previously had been printed.

Network functionality is provided via an internal JetDirect 600 print server. This device works with all of the major network protocols, including AppleTalk, IP, and IPX. Our favorite feature

of JetDirect is the Web JetAdmin utility.

Though we did have to download this utility from HP's site, once installed, it let us view the printer and configure the network from a standard browser. Web JetAdmin also lets you monitor usage and check for problems.

As a printing workhorse for networks, the 8100 is as flexible and as powerful as they come. **HP LaserJet 8100.** List price: \$3,295. Hewlett-Packard Co., Palo Alto, CA; 800-752-0900; www.hp.com; 401 at www.pcmag.com/infolink.



A Double-Duty Firewall

The MultiTech Dual Ethernet ProxyServer turns out to be a capable firewall in proxy server clothing.

By Les Freed

Despite the name, the MultiTech Dual Ethernet ProxyServer, model MTPSRI-120 (\$795 list) isn't a proxy server at all. This medium-size box actually contains a small IP firewall, which is designed to share a cable modem, DSL, or other fast Internet connection over a LAN. In addition, the MultiTech costs about half as much as competing products such as Sonic Systems' SonicWall Plus.

There's a fine yet important

distinction between proxy servers and firewalls. Many proxy servers include some basic firewall functions; they normally reside on a server on a LAN and provides shared access to a few selected Internet protocols. Firewalls also provide shared Internet access but additionally handle *all* IP traffic between the local LAN and the Internet.

The MultiTech is easy to install and configure. In most cases, you connect one of the unit's two 10Base-T Ethernet ports to your LAN and the other

to your cable or DSL modem. If you don't have an Ethernet-connected Internet connection, you can use the unit's RS232-V.35 serial port to connect to external serial devices, such as a T1 DSU, a standard serial modem, or an ISDN terminal adapter. If you're using a modem or ISDN TA, the MultiTech can automatically dial into your ISP on demand and will disconnect the line after a user-defined period of inactivity. A second serial interface is used as a configuration and administration port.

Once you've connected the hardware, you use the Windows-based configuration software to configure and manage the MultiTech. You must connect a PC to the unit's configuration serial port to perform the initial installation, but subsequent configuration changes can be performed from any PC on the LAN, using the MultiTech's

built-in Web interface.

If you're setting up a SOHO LAN, you can use the MultiTech's built-in DHCP server to provide IP-address and gateway information automatically for all the PCs on the LAN. If you're adding the unit to an existing LAN, you'll need to reconfigure your client PCs to use the MultiTech as the default gateway.

The unit provides a complete suite of firewall services, including IP filtering by port, protocol, and address. You can use the filters to fine-tune your users' access to the Internet by blocking protocols that are not strictly business-related.

The MultiTech's firmware resides in flash ROM, and periodic updates are available free from the vendor's Web site.

MultiTech Dual Ethernet ProxyServer, model MTPSRI-120. List price: \$795. MultiTech Systems Inc., Mounds View, MN; 800-328-9717; www.multitech.com; 402 at www.pcmag.com/infolink.

SETUP: A Web interface walks you through everything, including IP configuration.

Lighten Your Load

The NetApp F760 helps you off-load your file services and free your network storage.

By Russ Iwanchuk

A familiar scenario at a growing company: You are using a Windows NT Server for your users' network storage, and you need a machine to run your applications. If you run them from the file server, you risk overburdening the machine. On the other hand, if you decide on separate machines, you have the additional overhead of maintaining another server.

Network Appliance suggests you off-load the file services to one of its NetApp F700 series units, dedicated file servers—or filers. A filer looks just like any other Windows NT server on your network, has all the high-reliability and availability you could ask for, is easily administered, and performs impressively to boot.

The F700 series has three offerings, from the enterprise-aimed F760 to the workgroup-targeted F720. The high-end F760 we tested (\$166,250 list) was equipped with a 600-MHz Alpha processor, 1GB of ECC RAM, Fast Ethernet and Gigabit Ethernet interfaces, and four seven-disk hot-swappable Fibre Channel Arbitrated Loop (FC-AL) arrays of 9GB disks, providing 232.2GB of storage at RAID 4.

Network Appliance offers SCSI disks for its filers, but you can get the most storage space by using FC-AL disks and arrays. The maximum number of 9GB FC-AL disks is 168, for a total storage space of 1.39TB. For those of you doing the math, the total space cited takes into account RAID 4—permanently enabled with the F700 series. Making them even more highly

reliable, filers are rigged with hot-spare disks, redundant fans, and power supplies.

Beyond having an impressive hardware spec sheet, the F760 has excellent Common Internet File System (CIFS) integration, as well as support for Unix NFS



FILE IT: The Network Appliance NetApp F760.

clients. Under Windows NT, after you assign an IP address to one of the network interfaces (besides those mentioned above, ATM and FDDI are also available) and point the filer to your domain controller, the filer uses native Windows NT domain security for its user authentication information.

The filer appears in the Network Neighborhood as another Windows NT server, albeit a fast one with a lot of disk space, and administrators can share the volume using Server Manager. A filer can also impose disk quotas on users, a feature currently missing from Windows NT.

You can also take Snapshots (point-in-time copies of the entire file system), which are kept on the file system itself and can be made accessible to users.

We were impressed with the F760's performance:

The unit turned out NetBench throughput numbers of over 140

Mbps with RAID level 4—close to the throughput results we got with Windows NT on a uniprocessor Xeon server running RAID 0.

Network Appliance NetApp F760. List price: \$166,250. Network Appliance Inc., San Jose, CA; 800-443-4537, 408-367-3000; www.netapp.com; 402 at www.pcmag.com/infolink.

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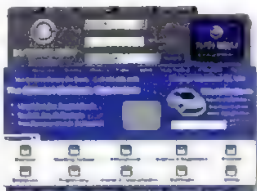


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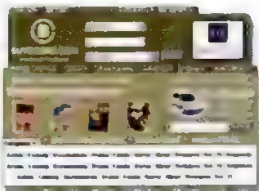
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iMac Gains More Supporters

By Tom Pope and Nick Stam

The response to our First Looks review of the iMac was overwhelming, but a surprising number of the hundreds of participants in our online TalkBack forum seemed to have missed the point: We liked it! In fact, we liked the iMac so much that it was a finalist for our Technical Excellence Award.

When the iMac was first released, there weren't a lot of things out there to hook up to its USB ports, but since then a host of new products have appeared for the iMac, and many familiar ones have been retooled for it. Printers, scanners, digital cameras, USB hubs, joysticks, gamepads, and video input devices are all available.

The iMac's 56K modem ran into a few problems at first, which Apple quickly addressed with a software patch. But if 56K isn't fast enough for you, Ethernet-to-ISDN adapters are now available. And for those of you who have cable modem service in your area, the iMac's

built-in Ethernet makes it cable modem-ready.

Storage was another concern early on, but several options have recently been made available, such as the Imation SuperDisk (\$150 street). The USB version of the Iomega Zip Drive is several weeks away. LaCie has also announced external USB hard disks for the iMac.

The iMac's mouse also met with mixed reviews. If you're not a fan of the circular design, you can try alternatives such as the iMouse or the iBall, from MacAlly, which also makes the iKey keyboard and the iHub four-port USB hub—all of which are translucent dark blue to match the iMac's snazzy look.

Apple is now shipping the Rev.B iMac, with more video memory (6MB versus the original 2MB) and an improved 3-D chip set (the ATI Rage Pro versus the Rage IIC). Adobe Page-Mill 3.0 has also been added to the software bundle.

We thought the iMac looked very good the first time. Now that it's been in use for a couple of months—in office settings as well as homes—with no significant problems and with more peripherals available to fill the gaps left by its design, we consider the iMac to be one of the standard-out computer products of the year.

...And More iMac Tests

Many of the participants in our online discussion of the iMac argued that we should have upgraded the iMac's graphics memory (SGRAM) to the maximum 6MB from the default



IMAC APPEAL: Apple's stylish, translucent blue iMac turned more than a few heads in PC Labs.

2MB. The contention was that the additional graphics memory would have let the iMac perform much better on some of the more graphics-intensive tests we presented.

Our original testing goal was to compare the default configurations of the iMac and PCs, given Apple's claims that the standard iMac performs up to three times better than similarly priced PCs. Still, we added 32MB of system memory to both the iMac and Dell's Celeron 333-MHz PC to bring them to 64MB, to permit our Photoshop tests to execute from memory and not swap to disk.

This represented a fairly similar price increase for both systems.

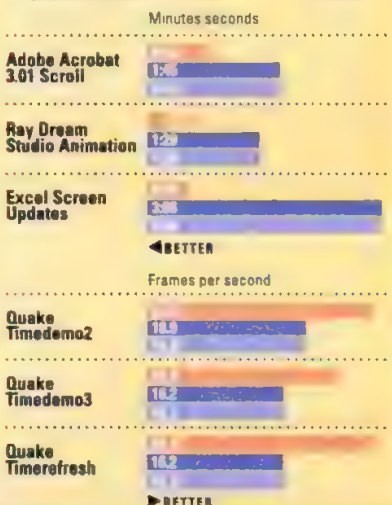
We knew our tests weren't sensitive to additional SGRAM, but based on the user feedback, we felt it necessary to run the graphics-oriented applications with 6MB of SGRAM on the iMac. Our results were nearly identical, as you can see in the chart to the left.

Some folks wondered about the versions of Microsoft Office used on the iMac and PCs, since we failed to publish the information explicitly in the performance review. We used Office 98 for the iMac and Office 97 for the PCs. We apologize for the omission.

Graphics RAM Inspection

On graphics performance, the iMac lagged behind a comparably priced Celeron-based PC, even after we loaded the iMac to its graphics memory capacity.

Dell Dimension V333c (8MB graphics RAM) iMac (2MB graphics RAM) iMac (6MB graphics RAM)



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Tell us what you think...How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product every week and summarize your comments here. Below are just two of the hundreds of comments from our discussion of Apple's iMac.

The iMac is still the ideal computer for those who want easy Internet access, and an easy-to-use and fast home computer. Any 8-year-old can use and maintain a Mac. And for Mac users, maintenance does **not** mean reinstalling the system software every week.

—Ken Cox

The iMac is just a publicity stunt to get people to look at Apple one last time. Apple has always lied about the Mac's performance and usually has to show its computers in summer blockbuster movies to get some appeal. Apple is going nowhere.

—Mario Milicevic

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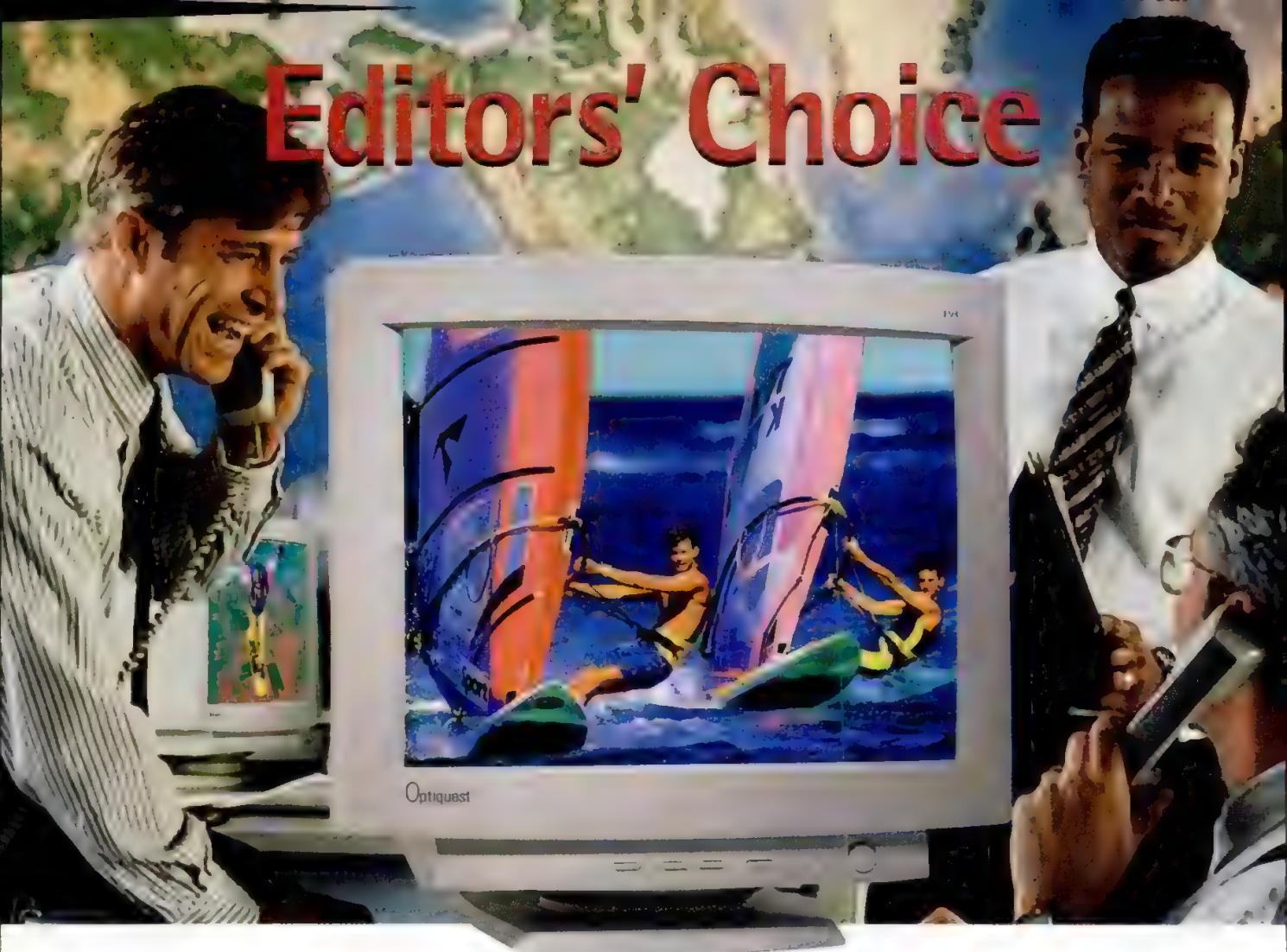
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PC Magazine October 6, 1998 - page 202

It's one thing for a company to claim its products are the best. But when a publication like PC Magazine honors it with their respected Editors' Choice, you sit up and take notice. Optiquest took the concept of a large screen monitor, combined it with a small footprint, and designed a winner – the 19" (18.0" viewable) **V95**.

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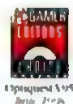
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Do You Sing to Your PC?

There you sit, with more computing power than it took to build the Space Shuttle, and all you care about is how fast your screen refreshes when you hit the PgDn key. I know you didn't ask Intel to build in all those MMX instructions, but now that you've got them, how about putting them to good use?

You probably have just as much (if not more) computing power at home, which is just the place to kick back and put it to work—making music. The capabilities of today's machines have really let designers cut loose with some amazing products. Here are a few of them that you can pursue at your leisure.

MIDI sequencers that will play your music and transcription programs that will write it out have been around for at least a decade. But they've required a MIDI keyboard or other digital instrument to get the notes in there, or laborious, note-at-a-time clicking and dragging with the mouse. Wouldn't it be great if you could just play the instrument of your choice, or even sing the notes, and have them show up as sheet music?

Wildcat Canyon's Autoscore (www.wildcat.com) does exactly that, with nothing more than a microphone plugged into your sound card. We're taught from an early age to leave music composition to the professionals, but did you ever overhear a kid at play make up words and melodies with carefree abandon? If you can recapture that youthful spontaneity, Autoscore can capture it to disk.

I tried Autoscore with an acoustic guitar, an electric bass, a piano, and my voice; each has individual idiosyncrasies, but after a few minutes' tinkering, I could see, edit, and play back a melody line from each. It's easy to overdrive the input to the sound card from an electric instrument, so you'll have to play with the level controls.

Autoscore is a pitch-recognition program, not intended for voice recognition, so your words don't show up on-screen. In fact, words will probably trip it up. The machine does much better with "la la la" and "dee dee dee." And don't expect it to record some blindingly fast arpeggio or run. Note recognition takes time. Because you're recording MIDI, you can record slowly and increase the tempo later.

You may, however, want to do exactly the opposite: You can take recorded music and slow it down so that you can study it, learn the words, or figure out a musician's technique and fingering. The long-

accepted technique for doing this has been to use a variable-speed tape recorder. The problem with tape, however, is that the pitch drops when you slow it down, so you can't tune your instrument to it, female voices sound like male voices, and male voices sound like effects from a cheap horror flick.

A number of hardware products let you record a sample and play it back in the same pitch at a different tempo, and professional studio musicians and deejays have had pitch-shifting and tempo-shifting products for years. But these are expensive devices. The small ones are quite limited in sample time, typically 30 seconds. Your PC has enough digital-signal-processing horsepower to do it all in software, and the best product I've seen to date is Slow Gold II, available from World Wide Woodshed (www.worldwidewoodshed.com).

Slow Gold will take anything you can get into Windows' Sound Recorder and let you break it down into convenient samples, which you can label, annotate, and play back at a variety of speeds. An acoustic guitar sounds almost cellolike at half speed, because of the sustain, but the pitch is the same, and that's the important part. The program includes a view of the recorded waveform, which makes it easy to pick off the exact musical phrase you want. You still need to listen carefully to pick the voice or instrument you're following out of the mix, but it's far easier at half- or one-third speed.

If you want to get serious about isolating an instrument or a vocal, you can try one of the excellent general-purpose shareware sound editors, such as Cool Edit (www.syntrillium.com) or Goldwave (www.goldwave.com), or you can choose a product that's designed for the task: RePlay Technologies' DeComposer (www.replayinc.com). DeComposer has the usual high, low, and bandpass filters, but the product also includes a handy note filter to screen out or select a specific range of notes.

These packages are just the beginning of a musical relationship with your PC. Sing to it, and it'll sing back. **PC**



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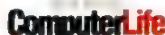
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The Looming E-Mail Disaster

While Y2K issues are grabbing all the headlines, a bigger and more looming threat to the Internet and to the worldwide business community is the security holes in the Internet, specifically in the e-mail architecture. These problems are so enormous that the system may fail completely in the next few years.

Already, numerous e-mail attacks that do all sorts of damage have been unleashed on the public. Various denial-of-service gambits and e-mail bombs are launched by jokers all over the world for cheap laughs.

Unfortunately, it's getting easier to create these problems. Any offense whatsoever from a friend or enemy can clog your e-mail box with junk. Even filtering doesn't help, because the junk is so voluminous that the server can be overloaded. Filtering only cleans up the e-mail; it doesn't keep messages from coming in. Aardvark (www.aardvark.co.nz), a New Zealand online publication, describes how easy an e-mail attack is:

"The hole is exploited by malevolent Net users when they sign up for a free e-mail account with USA.net then subscribe to the many free e-mail information services offered on the very next page. They can also subscribe to any number of mailing lists and respond to the requests for confirmation before setting up the account to forward all the received e-mail to the mailbox of whomever they choose as their victim."

In other words, you set up an e-mail account using a fake name, load up with various junk subscriptions, and then forward all the e-mail to somebody's real mailbox. This is called an "e-mail bomb attack." The POP mail-forwarding feature for free e-mail should be abolished. People would be less likely to pull a stunt like this if it actually cost money. The problem is that these Web-based e-mail systems have to compete on features to keep people coming.

Though these issues seem benign now, there's no evidence that they're going to lessen. When you bring this topic up with Net superstars (a.k.a. hackers/security experts), they go into the "Hackers' Ethic" nonsense. Real hackers, they say, are not malevolent, nor are they "crackers." (The terms *hacker* and *cracker* have become intertwined, much to the dismay of real hackers.) They go on to say how a real hacker would never pull these pranks, which are considered lame. "Lame" is the worst thing you can call something or someone in this milieu.

Superstar computer types who can sneak into

any system and trash machines will not do so, out of a regard for a higher ethic. Big deal. It's all the *other* people who will do the damage. Anyone can e-mail-bomb a boss or ex-girlfriend. But if someone wants to go on the Web to find more elaborate schemes, it takes no more than a few clicks to discover how to do chain bombs, error message bombs, covert distribution, and so-called mail exploder exploitation.

All Internet-based mail uses SMTP, usually in combination with a mail transfer agent (MTA). Any weakness in such systems can be exploited. The mail system was not established to protect users, because the Internet had always been a network of trustworthy academics and good folks. No protection was needed. Efficiency was the key. Sendmail, the de facto standard MTA program, is at the heart of Internet mail; elaborate e-mail attacks can be orchestrated using scripts (available on the Net) that exploit the weaknesses of the Internet e-mail system and Sendmail in particular.

Besides clogging your mailbox, hackers can easily slander you or your business by using the covert distribution channel technique, whereby a letter under your name and possibly even routed out of your server can be sent to millions of people. The true source of the message is completely hidden if this is done properly. This is more than "spoofing," where you merely change the name on the "From:" line using Eudora. I'm surprised that political dirty-tricksters haven't exploited this technique to create channels of misinformation. (Or maybe they have!)

The best document I've seen outlining the emerging worldwide e-mail problem is "E-Mail Bombs and Countermeasures: Cyber Attacks on Availability and Brand Integrity," by Tim Bass et al. (www.silkroad.com/papers/html/bomb). The future of e-mail will be grim, according to the authors, unless the entire system is completely reengineered. Y2K has more priority, but this situation is more dangerous. Y2K will get all the attention while this situation deteriorates. Public-key encryption will help a little in the short term, but this problem is going to worsen if something isn't done immediately. It may already be too late.



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John C. Dvorak's



INSIDE TRACK

The microprocessor design community is **gaga** over the **upcoming K7 chip** from AMD. Beginning with a 500-MHz version in early to mid-1999, the chip should ramp up quickly to gigahertz speeds and beyond. Both consumer and high-end versions will be available, the latter having a large L2 cache. It should do well in low-end systems **without an L2 cache** (or so they say), since the L1 cache is 64K.

The chip will begin life using a 0.25-micron process and quickly change to a 0.18-micron process in 1999. But we've heard **aggressive promises** from AMD before. The semiconductor guys are sounding more and more like software vendors with all this optimism. The chip will fit into a new 200-MHz Slot A connector. AMD is hoping its **3DNow! architecture** will hold up against the eventual improved KNI offering from Intel. Luckily, AMD is taking large chunks of the low-end market, where the majority of gamers (the biggest users of advanced 3-D designs) dwell looking for the best inexpensive machines they can find.

What concerns me is that the NexGen team (which saved AMD's loaf after its K5 debacle) isn't mentioned in any of the analyses of the K7. One must assume NexGen folk are **working on the K8** down the road.

Whatever happens with these next-generation chips, I sure hope someone finds something new for them to do! We don't need a 3-D gigahertz superchip to run Microsoft PowerPoint or Word. No matter how hard Microsoft tries to **bloat its code**, it can't keep up. We need new applications.

Meanwhile, Intel has added yet more code names to its lexicon. Starting with the current Xeon chip, we're supposed to evolve to the Tanner, then the Cascades later next year, which will be the last of the so-called Katmai-core chips. This will change to a **new 32-bit core called the Willamette**, which will bring on the Foster and maybe another chip. These chips should be the **end of the line** for anything resembling a 32-bit Pentium. The 64-bit Merced starts a parallel track about the same time and evolves into the McKinley, the Madison, and the Deerfield, peaking in performance around 2002 and probably **running out** of places in the Pacific Northwest to use as code names around 2005.

Finding New Ways to Charge for Usage Dept.: The bit-meter looms! You know there will be a never-ending battle over 24/7 usage of the Net. It represents the obvious future of a plugged-in world, but nobody providing a wire or even a wireless connection can live with flat fees. **It drives them crazy** that someone can have a connection and not pay by the hour! They pull their hair out thinking about it.

Now the thinking is turning toward the **concept of metered usage** (similar to what the electric companies use). If you use more "bits" than someone else, **you should pay more**. You'll start to see this crop up on ADSL, and an attempt will be made to price T1s this way, too.

Already the DirecPC satellite folks have been sued for **limiting downloads**. Now I hear from a reader in Montreal that Videotron and its cable modem system is **limiting usage to 4GB a month** bidirectional. Any uploading and downloading that exceeds 4GB is **metered** at 10 cents per megabyte. This adds up fast with high-speed streaming feeds. The cable folks can argue that someone's **high usage** can affect systemwide efficiency. You have to wonder what the phone companies are going to argue; their pricing has historically been based on time of connection. Whatever they decide, **you can be certain it'll be a gyp**.

Time Marches On Dept.: The LCD panel, which many believed would never be practical for large detailed displays anytime soon, is moving ahead at a rapid clip. IBM is behind a lot of the **radical and aggressive** research, as it was with the hard disk. The company is looking to **double the current best resolution** of today's flat panel by delivering a **200-pixel-per-inch display** code-name Roentgen. I hope the code name isn't being used because the thing gives off X rays! The prototype screen is **16.3 inches, delivering a 2,560-by-2,048 image**. IBM isn't saying what it's going to do with this technology, but I'd expect its previous joint venture with Toshiba will be revitalized.

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Even the original 2.6GB DVD-RAM drive isn't shipping in any quantity. Meanwhile, there's the DVD-R/W from Pioneer at 4.7GB (vaporware), **second-generation DVD-RAM** at 4.7GB from the consortium (vaporware), the NEC MMVF (Multi Media Video File) with a 5.2GB capacity (yawn), and the offbeat DVD+RW, a 3GB drive (no chance) from Philips and Sony. Philips and Sony are said to be planning on increasing the capacity to 4.7GB ASAP. **Copy protection** continues to be the critical issue in drive design, because Hollywood believes that these things are going to be used only to copy movies. Don't get me started! 

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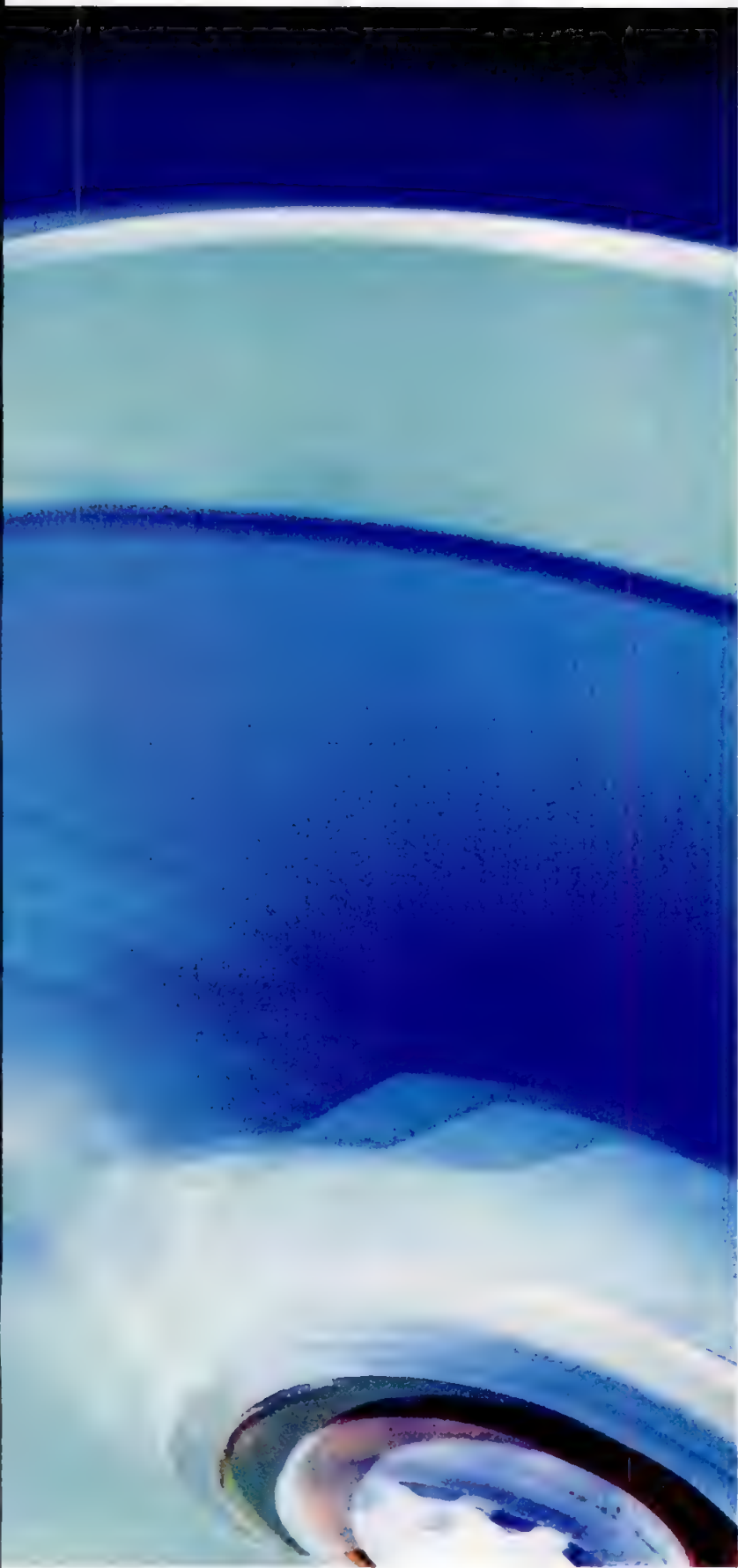
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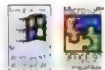
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V.90 Hits the Road, Sort Of

I don't travel constantly, though it often seems that way. A week and a half out on a two-week trip, hitting my fourth city—Is this Baltimore? Greenville? DenverSanDiegoMilwaukee? Does it matter?—the joys of life on the road seem pretty dim. From your letters, I gather many of you lead the same kind of

peripatetic life. With, of course, a notebook PC in tow.

How else could we possibly keep up? Not just with computing on the road, from Microsoft PowerPoint shows to Excel expense accounts to proposals, reports, and whatever, but with that newly essential lifeline: e-mail. I can go "off the air" for a couple of days, but knowing I'll face that ugly *You have 361 messages in your in-box* message gets me back online pretty quickly, steely resolve and mental health to the contrary.

Unfortunately, like a lot of you, I am hopelessly spoiled by fast Internet access. I expect to live in the T1 lane everywhere; but on the road, in the world of V.34 modems, I'm back to 20 Kbps to *mayyyybe*, on a good day, 28 Kbps. (What about V.34's promised 33.6-Kbps connections? Fuggedaboutit: I've yet to see one.)

So I was at the head of the line looking for 56K PC Card (a.k.a. PCMCIA) modems. Since the first units appeared midyear (months before the cross-"standard" V.90 standard was actually approved), I've looked at a slew of 56K PC Card modems. Modems only. Modems plus 10-Mbps Ethernet. Modems plus 10/100-Mbps Ethernet. Card Bus and not. And so on.

I'd like to tell you that all this tedium—and modem testing is not, trust me, one of life's great adventures—was entirely for you, dear readers: a selfless act. Not true. Sure, I wanted to be able to report that I'd found great 56K answers for road warriors everywhere, but what I really wanted was a great 56K answer for myself. I've learned a lot, and I have found one exceptional product. But I have not solved the V.90-On-the-Road problem. And I never will.

But if you're in the market for a new PC Card modem, or maybe for a new notebook with a built-in 56K modem, what I've learned will be helpful.

First, V.90 is not magic, and those legendary 56K connections are as elusive as ever. (Actually, of course, they're limited to 53 Kbps on the receiving side, thanks to an irrelevant government regulation limiting 56K devices to 53 Kbps. Irrelevant? Sure: Just as I've never seen a 33.6-Kbps connection outside a closed-loop test in a lab, I've never seen a 56-Kbps connection, nor even a 53-Kbps link, away

from the test bench. Welcome to the real world.)

My experience with 56K modems—both x2 (3Com/U.S. Robotics) and K56flex (Rockwell and the rest of the modem universe)—is that if you get into the mid-30s Kbps range, you're doing pretty well. Get into the low-40s Kbps range and you're having a Good Modem Day indeed.

Second, though V.90 was supposed to end the 56K protocol wars and unite the x2 and K56flex camps under one standard that each ISP would quickly support, there's still a lot of bumpf Out There about standards. Many ISPs are still in one camp or the other, and they aren't eager to replace their expensive banks of modems or even flash-upgrade them. So whether you can get a 56K connection *anywhere* depends on the ISP you're using. If you use multiple ISPs, add the complexity of a patchwork of standards among all those nice, convenient, local dial-up numbers.

Third, make sure any V.90 modem you buy has enough memory to let you flash it up to all four standards you need: V.34, K56flex, x2, and V.90. (Make that three, because V.34 is supposed to be included in all V.90 designs.) Many modems force you to drop one standard if you flash to another, because they have too little memory. Space and power constraints make this problem especially nasty in PC Card modems.

Fourth, it ain't the protocol, it's the line quality and more. No matter which modem you use, you're at the mercy of line quality and PBXs or other switches in your signal path that throw in too many analog-to-digital or digital-to-analog flops to let 56K work.

Fifth, forget about hotel rooms. *What? Isn't a hotel room the primary base for a road warrior's dial-up access?* Yes, it is. And to put it simply, you're not gonna get 56 Kbps—or anything beyond maybe 28 Kbps—in your hotel room, no matter the modem you use, no matter how much platinum clout your frequent-guest card may promise. Those phone lines in your free-upgrade Executive Really Swell Club Floor room run through the hotel's PBX, and it's going to trash 56-Kbps links.

That situation underscores the importance of



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Jim Seymour

good-to-great V.34 performance in any V.90 modem you buy for use on the road. And leads to the question: Can I beat the PBX?

A few tricks: If your room has a fax machine and you can get at its phone connection, try that. Many in-room fax machines use separate analog lines that do not run through a PBX. Or try the hotel's Executive Center, or whatever it calls its rent-by-the-hour computer center. Bring your notebook, pay the fee to use one of its PCs, then plug into the phone line for that desktop machine. If that doesn't work, see if you can persuade the Executive Center manager to let you (briefly!) disconnect the phone line running into its fax machine and plug in your modem.

Or consider using a phone line in a client's offices. Often, pure analog lines are run into conference rooms, and you may be able to Beat the Clock on one of those lines.

Is it all worth the bother? Frankly, not very often. I'll trade the relative comfort of my hotel room, drink at hand, for the awkwardness of hunching over the stale-Danish tray on the credenza in a borrowed conference room any day; a 50 percent faster connection just isn't worth the trouble.

If all this seems pretty discouraging—well, it *is* discouraging. I don't suggest you shy away from buying a new V.90 PC Card modem; just manage your expectations.

Two more tips: I said I'd found one gem of a V.90 modem—the 3Com Megahertz 3CXEM556B. You can get it with or without a 10-Mbps Ethernet connection. At about \$200 in the modem-only flavor and \$300 in the combo edition, it's not cheap, but it's consistently the fastest V.90 modem *and* the fastest V.34 PC Card device I've ever used.

Second, write down this phone number: 847-262-6000. That's 3Com's bulletin board, with the best free line-quality test I've found. Use Win 95's or Win 98's HyperTerminal program to dial into the BBS, then enter *line* as your first name and *test* as your last name. About 90 percent of the time, the BBS will accurately identify the line you've dialed in on as reliably "56K-able" or not.

Now...hmm...a quick look out the window. Des Moines? Knoxville? Albuquerque, maybe? **PC**

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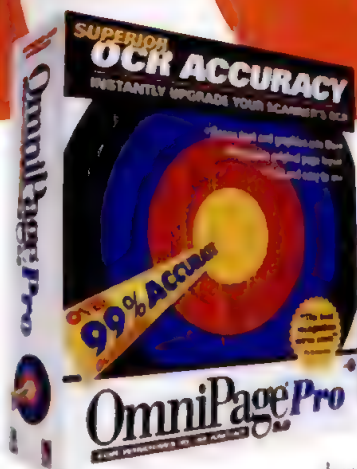
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Ten Trends for 1999

1999 may be "The Year the Market Stood Still." By computer industry standards, that is. The double whammy of the real or perceived year 2000 problem and the late arrival of Windows 2000 (NT 5) will make this a comparatively quiet year on the hardware side of the PC industry, even as the Internet

continues to grow exponentially. Understand, though, what we call soft growth in the PC industry would produce a banner year in just about any other industry. Here are ten trends worth tracking this year:

1. Y2K stalls everything. I'm convinced much of the year 2000 damage will be done before the calendar hits 2000. Y2K will be the IT bureaucrat's all-purpose reason for saying no. Virtually any request you make of the IT department may be put off with the response, "We're short-staffed and up to our elbows putting out year 2000 fires. Can't it wait?"

2. Windows 2000 is a nonfactor in 1999. Let's say Windows 2000, née Windows NT 5.0, actually ships this year. Nobody wants to be first to install the point-zero rev of a major operating system throughout a company. People will wait for 5.1, 5.2, or what would have been Win NT 6.0 to appear sometime in 2000.

3. Vendor shakeout. Second- and third-tier vendors used to charge hundreds of dollars less than Compaq, HP, or IBM. No more. You have to wonder how well Packard Bell will hold on among savvy home buyers. AST is barely visible these days. Acer is scaling back to first-time home buyers at a time when we're running short of them.

4. The ease-of-use hot button. Intel and Microsoft are convinced the way to sell more PCs and operating systems is to make them easier to use for as-yet-unconvinced first-time buyers. But I'm afraid we're still going to see more talk than action in 1999. Windows remains too complex and unstable, and PCs are still bulky and have too many cables.

5. Fast connections take off. Cable modem, DSL, satellite, and maybe ISDN are the way to go for fast data at home or in a business. (Even in large companies, cable modems could replace T1 lines.) Right now a cable modem looks like the best bet for speed, price, and market savvy.

6. Home LANs. Multiple-PC households ought to be connected, but only hard-core zealots will lay in Ethernet wiring. Using your existing home phone wiring looks to be this year's hot ticket, running at 1 Mbps (and shortly 10 Mbps). Wireless networking

has gotten better in a hurry, too. AC-line wiring is a passable alternative. All of these can be used for small-business networking as well.

7. Banner year for peripherals. With USB finally here and working, it makes sense to hang four or five peripherals off your PC. You could even control a UPS via USB rather than giving up a valuable serial port. If the product you want doesn't come in a USB version by midyear, odds are a competitor will have one. Don't put up with serial-port accessories any more. Since 1996 I've been saying the coming year was to be the year of USB; let's say that in this matter I've been a prophet ahead of my time. (Moral of the story: Even in the fast-moving PC industry, change comes more slowly than we'd like.)

8. The floppy disk meets its replacement. Look for cartridge disks to reach 200-plus megabytes this year: the Iomega Zip Drive (now 100MB), Imation SuperDisk LS-120, and Sony HiFD (which debuts at 200MB). Who'll be the floppy disk replacement? My money is on evolution, not revolution, meaning it comes down to products that can read and write 1.44MB floppy disks—from either Sony (ahead on performance) or Imation (ahead on price). If evolution wins, the Zip's tremendous market share lead could be all for naught, because it can't read floppy disks.

9. Desktop-equivalent notebooks. Watch for Intel's seminal Coppermine mobile CPU around September—a 400-MHz or better Pentium II with a 100-MHz bus on a 0.18-micron-wafer process. Couple that with an 18GB hard disk that's half an inch (12.7 mm) high and a 15-inch display and you're not going to give up much clout to a desktop PC. By comparison, the mobile Celeron, due early this year, is a cute little sideshow.

10. Not the year of 1999 will not be the year for: IrDA infrared signaling (its time may never come); Apple (the iMac is too little computer too late); IEEE 1394, or FireWire (because Intel kicked it out of the chip set until after 1999); digital cameras as consumer film-camera replacements (give them another couple of years); LCDs replacing CRTs on the desktop (they still cost too much, but boy, are flat panels seductive). **PC**



Even in the fast-moving PC industry, change comes more slowly than we'd like.

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*Mercury Research Data 11/94/95
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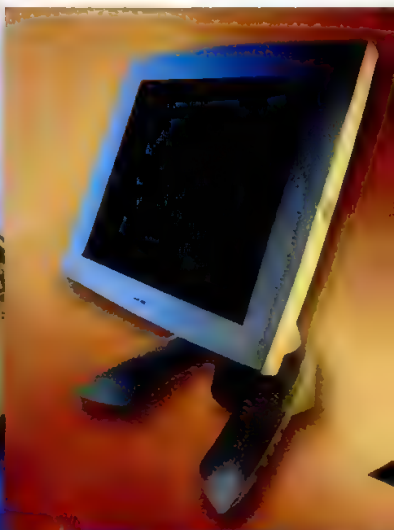
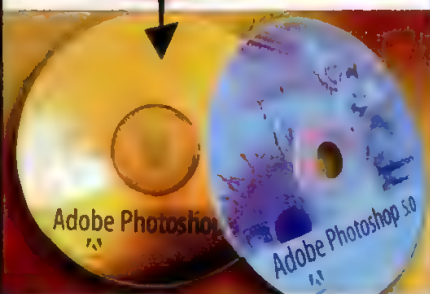


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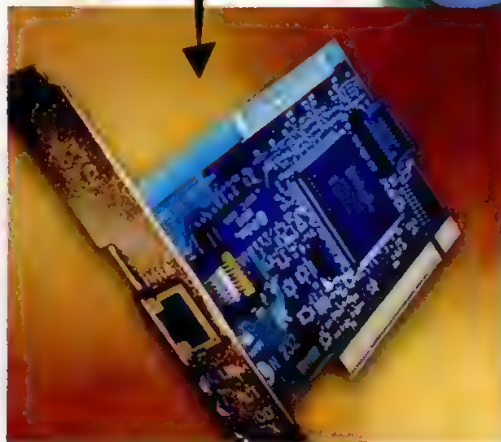
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PC **Page 112**
Toshiba Tecra 8000 • Compaq Deskpro EN 450 • Gateway G6-450 • IBM ThinkPad 560 • 3Com Palm III • Intergraph TDZ 2000 3D Graphics Workstation • Toshiba Portégé 7000

Adobe Photoshop 5.0 • Trellix
2.0 • Microsoft Publisher 98 •
Macromedia Fireworks 1.0 •
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• Quake II • First Aid 98 • River
The Sequel to Myst



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PHOTOGRAPHY BY THOM O'CONNOR

BEST OF

WHEN ONLY THE BEST WILL DO, LOOK NO FARTHER THAN OUR ANNUAL ROUNDUP OF THE TOP PCs, INTERNET SITES AND TOOLS, PERIPHERALS, APPLICATIONS, AND NETWORKING PRODUCTS.—FROM THE EDITORS OF *PC MAGAZINE*

Peripherals

page 116

Sony Digital Mavica MVC
FD81 • HP DeskJet 895C •
Creative Labs Graphics Blaster
3D • TNT • Toshiba TekBright
540 • HP ScanJet 6200C • Smart
and Friendly CD Rocket



In business and in life, it's important to strive to be the best. It's also nice to be *recognized* as the best. That, in a nutshell, is the reason *PC Magazine* exists. We don't just discover the best hardware and software among the hundreds of products tested and analyzed for each issue. More important, we state unequivocally which products deserve that label and back that claim with convincing benchmark test results and expert analysis. When we say a product is the best of a particular category, you can take that to the bank—or to the store.

To further the goal of recognizing the cream of the business, we pause at the beginning of every year to celebrate the best of the best, the several dozen products out of the thousands we've tested during the previous 12 months that are worthy of special acclaim.

To help round out this year's coverage, we asked five of our key writers and

columnists to select their personal favorites from the many new products shipped in 1998. Their comments are an indication that even our industry-standard benchmark test results are only the starting place for the internal discussion and debate that help us narrow our choices. The process is as subjective and exciting as it is analytical and scientific.

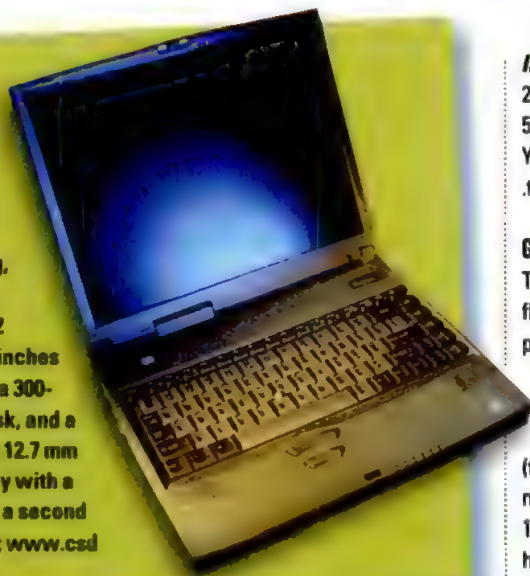
Here then is our annual compilation: the 53 best PC, Internet, peripheral, software, and networking products of the year. Together with those honored in the previous issue's Technical Excellence Awards for innovation and technological accomplishment, these important products helped make 1998 another rewarding year in personal computing.

For more information on a given product, find the ORS number at the end of a product description, then choose that number at www.pcmag.com/infolink.



Toshiba Tecra 8000

In the slim, light casing of a subnotebook, the Toshiba Tecra 8000 (\$4,400 street) offers the performance, battery life, and hardware found in today's leading desktop replacement units. In an unprecedented feat of engineering, Toshiba has incorporated hardware similar to that of its Tecra 780DVD into a machine that's half an inch thinner, 2 pounds lighter, and about \$1,500 cheaper. Measuring 1.7 inches thick and weighing just over 6 pounds, the 8000 includes a 300-MHz Pentium II, a 14.1-inch TFT display, an 8.1GB hard disk, and a removable second-generation DVD drive. The latter, only 12.7 mm thick, slides into a drive bay that can be used alternatively with a floppy disk drive, a CD-ROM drive, a second hard disk, or a second battery. • *Toshiba America Inc.*, New York; 888-598-7802; www.csd.toshiba.com (ORS 511).



Compaq Deskpro EN 450

When you're choosing a corporate PC, the most important requirement is that a system be easy to



manage and service. The Compaq Deskpro EN 450 (\$2,670 street) offers DMI 2.0 compliance, full system inventory capabilities, hardware monitoring, and chassis intrusion detection. Then it adds Insight Manager, so that the Compaq PC can monitor its disks and memory as well as detect imminent failure of these components. The components can then be replaced through the company's prefailure warranty. When Compaq's software is used with Microsoft SMS or another high-level management package, you get increased functionality, including the ability to flash the unit's

BIOS and lock its components remotely. Finally, the Deskpro EN 450 comes in a tool-free case, and although expansion is somewhat limited, even changing drives is a tool-free chore.

Compaq Computer Corp., Houston; 800-345-1518; www.compaq.com.

IBM ThinkPad 560, Toshiba Portégé 7000

This year a pair of subnotebooks

proved themselves well above the competition. Each weighing closer to 4 pounds than 5 and measuring just over an inch thick, the IBM ThinkPad 560 (\$3,600 street) and the Toshiba Portégé 7000 (\$3,500) nonetheless include 300-MHz Pentium II processors, 12.1-inch TFT displays, high-speed SDRAM, lithium ion batteries, and full audio subsystems.

Neither offers an integrated floppy disk drive, CD-ROM drive, or modular drive bay, but both can be used with external drives. In fact, you can augment the Portégé

with an optional CD Network Dock that snaps onto the bottom of the notebook, providing a CD-ROM drive, an Ethernet connection, two speakers, a floppy disk drive, and multiple I/O ports. IBM doesn't sell a similar device for the ThinkPad 560 but does provide an outboard floppy disk drive and, optionally, an external CD-ROM drive. The ThinkPad 560 also lacks an internal modem—the Portégé's salient advantage—but includes a PC Card modem and a much larger hard disk. For those willing to sacrifice internal floppy disk and CD-ROM drives for greater portability, these are today's leading Pentium II notebooks.



IBM Corp., Armonk, NY; 800-426-2968; www.pc.ibm.com/us (ORS 513). **Toshiba America Inc.**, New York; 888-598-7802; www.csd.toshiba.com (ORS 511).

Gateway G6-450

The Gateway G6-450 is a near-flawless system, ideal for both professionals and enthusiasts. For \$2,632 (direct), you get it all: a fast 450-MHz Pentium II CPU, a top 2-D and 3-D graphics card (the STB Velocity card with the nVidia RIVA TNT chip set and 16MB of SDRAM), a 9.6GB IBM hard disk, a 56-Kbps modem, and a 19-inch monitor. Also included are



a second-generation DVD drive, Boston Acoustics speakers, a rewritable-CD drive, and a choice of software, such as Microsoft Office 97 Small Business Edition. Gateway's Web site and round-the-clock technical support should be all the help you need. The three-year warranty includes one year of on-site support. Another plus: The unit's case is easy to service and roomy enough for upgrades. **Gateway**, North Sioux City, SD; 800-846-2000; www.gateway.com (ORS 514).

Gateway Solo 2500SE

Though the Gateway Solo 2500SE is not a performance leader and

incorporates only standard hardware, its price tag of \$1,999 (direct) cinches it as one of the best available values. With a hard disk, floppy disk drive, CD-ROM drive, 233-MHz Pentium II processor, 12.1-inch TFT screen, and 7.1-pound travel weight, the 2500SE combines power and adept graphics in a reasonably portable chassis. Its salient attribute, however, is its battery life, which exceeds 5 hours on a single, integrated lithium ion pack. If you substitute a 233-MHz Pentium MMX chip for the Pentium II, the price drops to \$1,799, or as low as \$50 per month. **Gateway**, North Sioux City, SD; 800-846-2000; www.gateway.com (ORS 514).

Gateway G6-333C

The Gateway G6-333C is an attractive machine, providing powerful core hardware, good homey touches such as a keyboard with programmable buttons, and adept multimedia capabilities for just under \$1,500. Gateway has taken a few steps to make home PCs easier to set up and use: The G6-333C ships with a clear, concise setup poster to help you assemble the machine, as well as extensive documentation. Its leading attribute, however, is Gateway HelpSpot, a software interface codeveloped with CyberMedia that offers additional system documentation, tutorials, a troubleshooting guide, a



means of restoring past software settings, and important links to Gateway's service-and-support Web site. Priced at \$1,478 direct, the unit surrounds the new "Mendocino" Celeron chip—a remarkable performer—with a 9.6GB hard disk, a 2X DVD drive, AGP graphics, and one of the market's leading home PC sound systems. **Gateway**, North Sioux City, SD; 800-846-2000; www.gateway.com (ORS 514).

3Com Palm III

Despite new competition from Windows CE palm-size devices, the PalmPilot continues to rule the hand-held market. The latest incarnation of the PalmPilot is the 3Com Palm III (\$369 list). Weighing a mere 5.7 ounces and measuring 0.7 by 3.2 by 4.7 inches (HWD), the Palm III fits neatly into a suit pocket. It includes an IR transceiver, 2MB of RAM, and a 160- by 160-pixel backlit display, and it can store approximately 6,000 addresses, 3,000 appointments, 1,500 to-do items, 1,500 memos, and 200 e-mail messages.

The device offers you a notepad as well as access to your PIM data and e-mail. Synchronization back to your PC is painless with the supplied cradle and software. Running on two triple-A batteries, the Palm III should last 8 to 12 weeks. The unit also benefits from the ever-

expanding range of third-party applications and accessories. **3Com Corp.**, Santa Clara, CA; 800-881-7256; www.palmpilot.com (ORS 515).

Intergraph TDZ 2000 3D Graphics Workstation

At one time Unix-based systems ruled the graphics workstation market, but today Wintel-compatible solutions provide more than enough muscle. The dual Pentium II/300-based Intergraph TDZ 2000 3D Graphics Workstation is the perfect example, thanks to two Ultra Wide, 10,000-rpm SCSI hard disks configured in RAID 0 and Intergraph's own Real2m II VX25 OpenGL graphics card.

There's plenty of upgrade room, and an external TowerMate for added drive space is optional. 512MB of ECC RAM is the memory maximum. The TDZ 2000 line now starts at Pentium II/333s (\$2,081 list) and goes up to the latest Intel processor, the Pentium II Xeon 450, in single and dual configurations. Graphics are now up to the Real2m II VX113 with AGP support



and geometry acceleration, and units with Ultra Wide 2 LVD SCSI disk controllers are available. **Intergraph Corp.**, Huntsville, AL; 800-763-0242; www.intergraph.com (ORS 516).



MY FAVORITES OF '98

The computers I tend to get most excited about—the way you might get excited about cars, politics, or sports—are the ones that keep the *personal* in personal computers: notebook PCs and home PCs. Like cars and sports teams, PCs are never perfect, but there was a lot to like in '98.

Of the many notebooks I've worked with the past year, I've become most attached to the IBM ThinkPad 600. The reason: It has just about everything you want or need, and its good points outweigh its quirks. In a package with a 5.5-pound system weight, you get a 13-inch, 1,024-by-768 display, a 4GB or 6GB hard disk, a removable CD-ROM drive, and a Pentium II processor. No system is perfect, and my 600's communications capabilities have been flaky, but it connects more often than not, and the integrated RJ-11 jack is the way to go.

My favorite small computer remains the 3Com Palm III (formerly known as the PalmPilot). It keeps my schedule and remembers every phone number I'll ever need, and the battery runs forever.

Among home PCs, the best thing that happened last year wasn't a PC but a CPU. AMD's K6 and follow-on K6-2 fueled the sub-\$1,000 market last year, capturing a third of all retail sales and half of all sub-\$1,000 PC sales. Another great trend in home PCs has been the enhancement of keyboards with controls for adjusting speaker volume, playing CDs, jumping on the Internet, or even playing phone messages. Take your pick: The Compaq Presario, HP Pavilion, and IBM Aptiva lines all have great keyboards.

"Among home PCs, the best thing that happened last year wasn't a PC but AMD's K6 chip."

BEST of Service & Reliability

The following PC vendors received grades of A in this year's Service and Reliability Survey (July 1998).

DESKTOP PCs

Dell
Hewlett-Packard
IBM

NOTEBOOKS PCs

Dell
Gateway



MY FAVORITES OF '98

Is it true that Internet technology evolves about seven times as fast as any other kind? It sure feels that way. We've seen breakthroughs in the past 12 months that will ultimately change the way we work and shop.

Take Netpodium (www.netpodium.com), a product that helps organizations use the Web to broadcast press conferences or facilitate any kind of information dissemination in an efficient and futuristic way. The broadcaster can send not only sound but also slide shows and presentations that run in sync with the audio.

Meanwhile, viewers can type in questions and even participate in instant polls. With prices from \$3,995 for 100 users up to \$24,995 for 2,000 users, Netpodium

may seem expensive, but for certain kinds of gatherings the interactivity it provides is invaluable.

At the other end of the price spectrum is JumpList (www.jump1ist.com) from i/us. The problem: You've built a lot of external links into your great Web site, but you don't have time to keep checking their validity. Enter JumpList. For \$30 a year, the service will keep tabs on your links, warning you via e-mail when a link has died.

It was also a good year for Web sites. Two of my personal favorites, ESPN.com (www.espn.com) and The Internet Movie Database (www.imdb.com), were redesigned. Watch for the IMDb's new owner, Amazon.com, to turn it into a huge video store in 1999. The most impressive new site of the year, however, is Microsoft HomeAdvisor (homeadvisor.msn.com). Its interface is unparalleled by any shopping service.

Internet BEST of 1998

Microsoft Outlook Express

Sending and receiving e-mail is still the most popular activity on the Web, and using Microsoft Outlook Express (OE) to do it will make your messaging productive and enjoyable. Its intuitive interface, ability to handle multiple accounts, comprehensive address book, and easy HTML functionality make it a great choice for consumers.

Bundled with Internet Explorer 4.0, OE supports all the relevant Internet standards: POP3 and IMAP4 for mail, LDAP for public address lookups, S/MIME for security, and more.

Microsoft Corp., Redmond, WA; 425-882-8080; www.microsoft.com/ie/ie40/oe (ORS 519).



Netscape Communicator 4.5

In the game of one-upmanship that the browser battles have become, Netscape unleashed the last volley of 1998 with the release of Communicator 4.5. While Netscape may not remain in the lead for long, since Microsoft has released a beta version of Internet Explorer 5.0, for most of 1998 Communicator was the one to watch—thanks to its innovative Smart Browsing concept, among other new features. The Smart Browsing features rely on Netscape Netcenter's search index and are a key part of the company's plans to promote the site as a portal along the lines of Yahoo! and Excite. Communicator's e-mail client, Messenger, has gotten a much-needed overhaul.

On their own none of these enhancements are really revolutionary, but together they add up to a browser that is easier to use and more functional, giving Netscape Communicator 4.5 the edge, at least for now.

Netscape Communications Corp., Mountain View, CA; 650-937-2600; www.netscape.com (ORS 537).

ICQ

ICQ (I Seek You) has come from seemingly nowhere to become one of the most widely used applications on the Net. In addition, its popularity has spawned a new category—

instant messaging—that is growing in popularity as both a social and a business tool. What makes ICQ stand out is its abundance of features. Beyond real-time chatting, ICQ supports file and URL transfer, off-line message composition, e-mail notification, message forwarding, multiuser chat, and contact lists, as well as offering excellent visual alerts and lots of configuration options. No program enables a better sense of community.

America Online Inc., Dulles, VA; +972-3-6488090; www.icq.com (ORS 538).

Macromedia

Dreamweaver 1.2

Microsoft Notepad still reigns as the most popular Web authoring tool for many Web professionals, because too many visual tools wreak havoc with HTML code. But as more developers get a look at Macromedia Dreamweaver (\$200 street), which lets you build visually appealing, cutting-edge Web pages without tampering with the purity of the code, Notepad's Web authoring days may be numbered.

Dreamweaver's excellent "Roundtrip HTML" editing lets you create Web pages using either

graphical tools or a raw HTML editor without affecting the output. You can embed Java applets, ActiveX controls and Netscape plug-ins, and JavaScript event handlers. DHTML code generation—for both Microsoft and Netscape browsers—is automatic. **Macromedia Inc.**, San Francisco; 415-252-2000; www.macromedia.com (ORS 520).

Alexa

Have you ever been surfing the Web and wondered where to go next? Alexa Internet is the browser utility of the year because it an-

Join Now !!!

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WebPact Magazine - Online
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NYTSYN
Javafold - IDG's magazine for the Java community - October 1998
Computer Currents Interactive

Related Links



swers that question—and does a whole lot more. Alexa appears as a small toolbar that works with your Web browser. As you navigate the Web, Alexa helps steer you to where you might want to go next, with a list of "related sites." The list is compiled using user trails, so it does

a decent job of guiding you to relevant information.

Alexa also gives you information about the site you're browsing. You can find the site's owner and address, see what other users and third parties like Yahoo! Internet Life think of the site, and check traffic and freshness estimates. **Alexa Internet**, San Francisco; 415-561-6900; www.alexa.com (ORS 539).

Netscape Enterprise Server Standard Edition 3.5.1

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*All prices shown are Compaq DirectPlus prices and are subject to change. Prices do not include applicable state and local sales tax or shipping to recipient's destination. †Leasing available through Compaq Capital Corporation (CCC) to qualified commercial customers, subject to credit approval and execution of CCC lease documentation. Monthly lease payments are based on 36-month fair market value lease, and do not include taxes, fees, or shipping charges. Offering subject to other restrictions and CCC reserves the right to change, alter, or cancel this offering at any time without notice. *For hard drives, GB = billion bytes. *24X Max CD-ROM data transfer rates may vary from 150 KB/s to 3600 KB/s; 32X Max CD-ROM data transfer rates may vary from 150 KB/s to 4800 KB/s. *Designed only to allow faster downloads from K56flex-compliant sources. Maximum achievable download transmission rates currently do not reach 56 KB/s, and will vary with certain line conditions. *Some restrictions and exclusions apply. Call (800) OK COMPAQ for warranty details. ©1998 Compaq Computer Corporation. All rights reserved. Compaq, the Compaq Logo, Armada, Deskpro, and ProLiant are registered trademarks and DirectPlus is a registered service mark of Compaq Computer Corporation. Intel, the Intel Inside Logo, and Pentium are registered trademarks and Celeron is a trademark of Intel Corporation. Microsoft and Windows NT are registered trademarks of Microsoft Corporation. Other products mentioned herein may be trademarks or registered trademarks of their respective companies. Operating system pre-installed on all portable products. Compaq is not liable for editorial, pictorial, or typographical errors in this advertisement.



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- 3-year limited warranty⁵

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- 32X Max³ CD-ROM
- Towerable chassis converts from desktop to minitower
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- 64 MB SDRAM
- Compaq S700 17" (15.7" viewable) monitor
- Matrox Millennium G200-SD AGP Graphics with 8 MB VRAM
- 32X Max³ CD-ROM
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty⁵

Options

Deskpro EP Series:

- Additional 32 MB SDRAM Memory: **\$79***
- 32X Max³ CD-ROM: **\$138***
- Upgrade to Compaq S900 19" (18" viewable) monitor: **\$200***
- SuperDisk LS-120 Drive: **\$116***
- Compaq C-Series 810 Handheld: **\$424***



Compaq Armada Notebooks

Armada 1700

The fully integrated notebook from Compaq that combines the latest key technology with uncompromising value.

\$2,299*

Leasing price: \$78/Month¹

- Mobile Intel Pentium II Processor 233 MHz
- 4.0 GB² SMART Hard Drive
- 32 MB SDRAM (expandable to 160 MB)
- 12.1" CTFT SVGA display
- 24X Max³ CD-ROM
- K56flex modem⁴
- Integrated AC Adapter
- Intelligent Manageability pre-installed
- 1-year worldwide limited warranty⁵

Armada 3500

The lightest notebook from Compaq, weighing only 4.4 lbs.

\$2,799*

Leasing price: \$95/Month¹

- Mobile Intel Pentium II Processor 266 MHz
- 4.1 GB² SMART Hard Drive
- 32 MB RAM (expandable to 160 MB)
- 12.1" CTFT SVGA display
- 4.4 lbs. and 1.3" thin
- Magnesium display for durability
- Intelligent Manageability pre-installed
- 3-year worldwide limited warranty⁵

Armada 7400

The 6.3 lb., 1.6" thin notebook, delivering the highest performance with the optimal combination of desktop equivalence and mobility.

\$3,999*

Leasing price: \$136/Month¹

- Mobile Intel Pentium II Processor 300 MHz
- 6.4 GB² SMART Hard Drive
- 64 MB SDRAM (expandable to 256 MB)
- 13.3" CTFT (1024 x 768) display
- Powerful AGP graphics
- 24X Max³ CD-ROM
- Magnesium casing for durability
- Intelligent Manageability pre-installed
- 3-year worldwide limited warranty⁵

Options

Armada 1700:

- Compaq Value Case: **\$49***
- 32 MB Memory Module: **\$89***
- Ethernet Convenience Base: **\$279***

Armada 3500:

- Mobile Expansion Unit with 24X Max³ CD-ROM: **\$199***
- Mobile Expansion Unit with DVD: **\$399***
- Additional Li-Ion Battery: **\$210***

Armada 7400:

- ArmadaStation II Expansion Base: **\$879***
- MultiBay DVD Drive: **\$419***
- Additional Li-Ion Battery: **\$189***

Buy direct from Compaq: 1800-888-0287
Or visit www.directplus.compaq.com

or if you prefer, call 1 800-AT-COMPAQ for a reseller near you.

COMPAQ
DirectPlus

Better answers.™

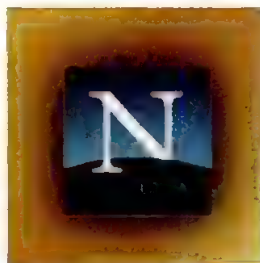
ering Web pages, Web servers are also application platforms. Nowhere is that more evident than in the power of Netscape Enterprise Server Standard Edition 3.5.1 (\$1,295 list), which combines innovative features with strong performance and wide availability.

Most notable are its content management features, which give you excellent tools for intranet environments. Netscape Enterprise also offers more power for Web development, with its support for its own application programming interface, NSAPI, as well as CGI and Java Servlets. And Netscape Enterprise runs on Windows NT, NetWare, and five flavors of Unix.

Netscape Communications Corp., Mountain View, CA; 650-937-2600; www.netscape.com (ORS 537).

Northern Light

Armed with a set of advanced search features to enhance its custom-search result folders and extensive Special Collection, Northern Light caters to the power searcher. It has an uncanny ability to turn up relevant hits. The basic search offers support for Boolean syntax, nested queries, wildcards, and truncation, while the advanced search makes it possible to limit by date, language, or



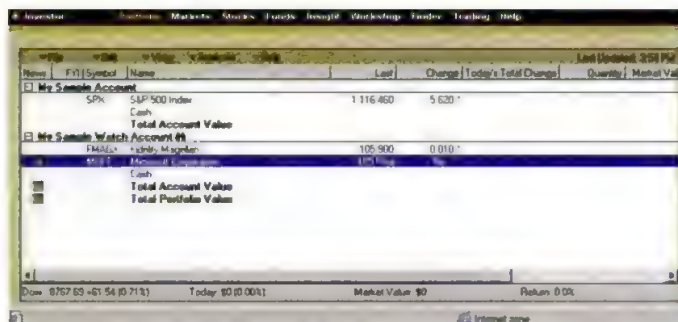
Light also continues to shine as a fee-based database service, offering full-text Special Collection articles from more than 4,500 periodicals, scholarly journals, and newswires.

Northern Light Technology LLC, Cambridge, MA; www.northernlight.com (ORS 540).

Microsoft Investor

With the stock market behaving like a game of Chutes and

Ladders, the Web has become a popular destination for market mavens. If you want to keep your own portfolio, double-check your broker's advice, or do your own homework, check out



domain. Hits are dynamically grouped into custom folders based on subject, document type, source, and language. Northern

Microsoft Investor, which puts all the relevant information at your fingertips for \$9.95 a month (\$6.95 for MSN members).

Excite

The best Web portals are not just starting points for your Web search, they're destinations in and of themselves. With its excellent personalization tools, anticipatory search ability, sense of community, and superior navigational framework, Excite best delivers on the dual promise of search and content. We especially liked the ability to create a customized Excite page with local weather, movie, TV, and sports information simply by entering our ZIP code and e-mail address. We also found that no other portal offered as many options for adding to a personal page.



Excite lets you select stocks to track, create multiple portfolios, find local events, and place content (such as the news that interests you and personal reminders) on your home page.

In the search arena, Excite anticipates what you want on common queries for subjects like sports teams and company information, steering you to relevant information more quickly. The lively chat and message boards are bolstered by great software to improve your experience, and the navigation rarely left us at a dead end even deep into the site. Excite Communities offers shared spaces for users with common interests. • **Excite Inc.**, Redwood City, CA; www.excite.com (ORS 536).

What separates Investor from the many other investment sites out there on the Web is its software. Nowhere will you find a

Amazon's site design is also top-notch. Its search engine intelligently returns top matches and full results that help you quickly find

BOOKS, MUSIC & MORE amazon.com

more impressive Portfolio Manager. Some of the research content, such as analyst earnings estimates, are subscription-based, but you'll find plenty here even for free. Microsoft has recently created a more comprehensive personal-finance site called Money Central, of which Investor is a part.

Microsoft Corp., Redmond, WA; investor.msn.com (ORS 519).

your target title. With Amazon now selling music—and video sales on the way—you may soon be using Amazon.com for all your entertainment needs.

Amazon.com Inc., Seattle; www.amazon.com (ORS 541).

Amazon.com

Amazon.com was among the first e-commerce sites, and in this year of e-commerce going mainstream, it's still the best. Even though the competition is biting at its heels, Amazon remains in front because of its healthy discounts, large inventory, notification service, one-click shopping, and recommendations. What Amazon does best, though, is make you feel that you're part of a community.

BEST of Support & Satisfaction

In the past year or so, Microsoft has made up a lot of ground in Internet software with Internet Explorer 4.0 and two messaging clients, Outlook and Outlook Express. But readers still most recommend the competition.

- ➔ Netscape Navigator (all versions)
- ➔ Eudora (all versions)

We hope you're satisfied.



Well, if you own a

Quantex systems feature the Intel® Pentium® II processor



Today, Quantex is one of the world's largest direct marketers of computer systems, featuring the Intel® Pentium® II processor. And in the last year, Quantex has consistently placed at or near the top in surveys of customer satisfaction and tech support. As well as winning dozens of product rating awards in the most respected publications.

As more businesses and experts say good things about Quantex, you're bound to wonder, "How good can they be?" There's one way to find out.

WOULD QUANTEX OWNERS BUY AGAIN? IN A HEARTBEAT!.

There's no greater expression of satisfaction than customers who return again and again. For Quantex owners, the intent to repurchase is practically a given. After all, when *PC World* asked—based on reliability and service—whether they'd purchase another Quantex system, the answer was a resounding "Yes."

That puts us ahead of some very big names.

QUANTEX TECH SUPPORT EARNS TOP SCORES FROM THOSE WHO KNOW US BEST—OUR CUSTOMERS.

In the most recent *PC Magazine* study, PC owners rated Quantex a leader for tech support based on their own experiences. For the technical knowledge of our people and the promptness of the resolution, no one beat Quantex. And no one came within 10 points for "tech tried everything to help." Not Dell. Not Micron.

WOULD YOU BUY AGAIN?		
Vendor	Based on Reliability	Based on Service
Micron	★★★★★	★★★★★
Quantex	★★★★★	★★★★
Dell	★★★★★	★★★★
Gateway	★★★★	★★★★
IBM	★★★★	★★★
Compaq	★★★	★★★
HP	★★★	★★★
AST	★★	★★
Acer	★	★

Five star is best possible rating; one star, the worst.
"PC World Reliability and Service Survey—Home PCs" Nov '98
 *calculations based on online participants' responses recorded between May 1998 and June 1998

COMPUTER SHOPPER
1997 Direct Channel
Achievement Award

PC COMPUTING
1997 Most Valuable
Product Award

PC COMPUTING
5 Star Rating
(11/98)

PC COMPUTING
5 Star Rating
(10/98)

PC WORLD
Best Buy Award
(10/98)

PC WORLD
Best Buy Award
(9/98)

PC WORLD
#1 Best Buy
Award (8/98)

PC WORLD
#1 Best Buy
Award (7/98)

Results based on a PC World (Nov '98) 'Home PCs Reliability and Service Survey' in which Quantex received a 5-Star rating for Buy Again Based on Reliability and 4-Star rating for Buy Again based on Service.
 Buy again based on reliability: Five stars: 96.4 to 95.1%. Four stars: 93.2 to 91%. Three stars: 86.4 to 86%. Two stars: 84.4 to 81.5%. One star: 77.9 to 72.5%.
 Buy again based on service: Five stars: 94.1 to 93.8%. Four stars: 90.4 to 86.1%. Three stars: 82 to 75.6%. Two stars: 73.6 to 70%. One star: 60.3 to 60.1%.

Quantex PC you are.



Not Gateway. Not IBM. Not Compaq.

Hey, we may not be a household name yet. So we go the extra mile. And our customers notice it.

TECH SUPPORT EXPERIENCE

Vendor	Tech was knowledgeable	Tech tried everything to help	Prompt resolution	Got a run-around
Quantex	57%	59%	49%	9%
Micron	56%	47%	43%	9%
Gateway	54%	48%	45%	10%
Dell	54%	43%	49%	10%
IBM	41%	33%	36%	15%
Compaq	37%	30%	30%	17%
Average*	40%	33%	32%	16%

"Service and Reliability Survey," PC Magazine, July 1998

* calculations based on all 25 PC vendors evaluated in the survey

QUANTEX SYSTEMS KEEP WINNING. COMPETITION AT A LOSS.

Obviously, it takes a lot more than great support to generate great customer satisfaction. And more than VERY competitive prices. It takes great computers featuring the Intel Pentium® II processor. And Quantex configures them with industry-standard "enhancements" that make Quantex systems regular winners in the "Best Buy" category.



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PC WORLD
#1 Best Buy
Award (6/98)

**WINDOWS
MAGAZINE**
WINLIST Award
(11/98)

**WINDOWS
MAGAZINE**
WINLIST Award
(10/98)

C|NET ONLINE
Editors' Choice
Award (8/98)

C|NET ONLINE
Editors' Choice
Award (6/98)

PC PORTABLES
Best Buy Award
(3/98)

PC COMPUTING
4-star "Torture Test"
Survivor (4/98)

PC COMPUTING
4-star Rating
(9/98)

Results based on PC Magazine (July '98) "Service and Reliability Survey" in which Quantex received the highest ratings for its customers' "Tech Support Experience" in 4 out of 5 categories including "tech was knowledgeable, tech tried everything to help, prompt resolution and got a run-around." Calculations based on 25 vendors evaluated in the survey



Systems with better



BETTER MANAGEABILITY MEANS BETTER PRODUCTIVITY FOR YOUR BUSINESS.

Quantex Business Desktops bring enterprise management technology, traditionally implemented by large corporations, to businesses of all sizes—including yours. Built according to industry-standard initiatives such as Wired for Management, DMI 2.0, PC 98, LDCM and ACPI, these desktops are designed to lower your total cost of ownership. They also incorporate capabilities for improved asset management and remote configurations and diagnostics. Plus, our innovative **Q Sentry Technology** assures unsurpassed confidence and security by constantly monitoring the health of Quantex PCs. If you want to do something more productive, install Quantex Business Desktops. **Starting at just \$999**

TAKE A FLAT APPROACH TO YOUR WORK

Looking to provide your business with a better view? Quantex gives it to you with its state-of-the-art 15" LCD flat-panel monitors with on-screen controls. Engineered with advanced technologies, these active matrix TFT flat-panels produce clear, crisp pictures with bright vivid colors, and include landscape and portrait modes. All this while saving approximately 75% of the desk space and up to 70% of the power used by traditional CRT's. *Available as an upgrade.*



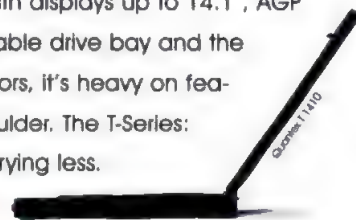
15" LCD Flat-Panel

NOT HAPPY STAYING IN ONE PLACE? GREAT!

THE "T" SERIES: TRAVEL LIGHTER AND ARRIVE HAPPIER.

It's time to stop thinking about notebooks as a compromise between mobility and performance. Quantex presents the T-Series Notebook, full-featured power in a lightweight mobile computing solution. It packs huge performance and flexibility into a lean 1.43", 6.4-pound system, perfect for working on a plane or during an important presentation. With displays up to 14.1", AGP graphics, a single, swappable drive bay and the fastest Pentium® II processors, it's heavy on features but light on your shoulder. The T-Series: start packing more by carrying less.

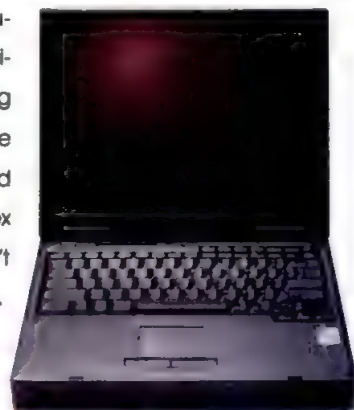
Starting at just \$1999



THE "I" SERIES: A DESKTOP AND NOTEBOOK IN ONE.

Take the best of both worlds and put it into one powerful system. You'll have the Quantex I-Series Notebook, designed to make work easy—and you happy. Rip through projects with fast Pentium® II processors, tons of SDRAM, long-lasting 12-cell Lithium Ion batteries and more. Plus, the built-in dual drive bay design allows for simultaneous drive use and added functionality. And with DVD and an ATI AGP 3D 8MB graphics accelerator, you'll discover incredibly brilliant ways to experience presentations and dynamic multimedia on the stunning 14.1" display. For extreme computing power and performance, the Quantex I-Series Notebook doesn't just replace your desktop. It humbles it.

Starting at just \$2199



Quantex I-Series

CALL 800-346-6572 TO ORDER OR

performance built in.

BUSINESS DESKTOPS

QP6/333 SB-1c \$999

Business lease: \$35/Mo.

- Intel® Celeron® Processor 333MHz
- 32MB SDRAM Memory / 128KB Secondary Cache
- 4.3GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- 64-bit 3D AGP Graphics Card with 4MB SDRAM
- New Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98
- 3-year limited warranty with 1-year On-Site Service*
- 24-hr./7-day Technical Support
- QEntry Technology (Including Intel LANDesk Client Manager V.3.1)
- Cable Modem Ready / Year 2000 Compliant
- Upgrade to Windows NT Workstation 4.0 for \$99

QP6/333 SB-1(w/ Pentium® II Processor).....\$1049
QP6/350 SB-1(w/ Pentium® II Processor).....\$1089

MS OFFICE 97 SBE v2.0 : Word 97 • Excel 97 • Publisher 98 • Outlook 98 • Direct Mail Manager • Small Business Financial Manager 98 • Expedio Streets 98 • IE 4.0

QP6/350 SB-2 \$1399

Business lease: \$49/Mo.

- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/ OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- New Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- QEntry Technology (Including Intel LANDesk Client Manager V.3.1)
- Cable Modem Ready / Year 2000 Compliant
- Upgrade to Windows NT Workstation 4.0 for \$99

QP6/333 SB-2(w/ Pentium® II Processor).....\$1349
QP6/400 SB-2(w/ Pentium® II Processor).....\$1549

QP6/400 SB-3 \$1649

Business lease: \$58/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD 6 NEC ChromaClear CRT (16.0" viewable, 25 dp, 1600x1200 max. resolution)
- Intel740™ 3D 2X AGP Graphics with 8MB SDRAM
- New Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- Microsoft Office 97 SBE v2.0
- Upgrade to MS Office 97 Professional for \$199
- 3-year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- QEntry Technology (Including Intel LANDesk Client Manager V.3.1)
- Cable Modem Ready/Year 2000 Compliant/Windows 2000 Ready
- Upgrade to 15.0" LCD Flat-Panel Display for \$549

QP6/350 SB-3(w/ Pentium® II Processor).....\$1499
QP6/450 SB-3(w/ Pentium® II Processor).....\$1849

QP6/450 SB-4 \$2099

Business lease: \$74/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/ OSD (18.1" viewable), 1600x1200, 26dp
- New Ultra-Fast #9 Revolution IV 128-bit 3D 2X AGP Graphics w/27MHz
- New Intel Pro 10/100 PCI Fast Ethernet Controller w/RJ-45 and Wake-On-LAN Technology
- 32X Max Variable Speed CD-ROM Drive
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- Microsoft Office 97 SBE v2.0
- Upgrade to MS Office 97 Professional for \$199
- 3-year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- QEntry Technology (Including Intel LANDesk Client Manager V.3.1)
- Cable Modem Ready/Year 2000 Compliant/Windows 2000 Ready
- Upgrade to 15.0" LCD Flat-Panel Display for \$399

QP6/400 SB-4(w/ Pentium® II Processor).....\$1899

BUSINESS NOTEBOOKS

Quantex T-1310 \$1999

Business lease: \$70/Mo.

- Pentium® II processor 266MHz
- New Ultra-Thin Design (12.44"x9.84"x1.37")
- 13.1" XGA Active Matrix Display
- 64MB SDRAM / 512KB Secondary Cache
- 4GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- 24X Modular CD-ROM Drive / 3.5" Modular Floppy Drive
- New NeoMagic NM65 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Corel Office Suite 8
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1400 \$2199

Business lease: \$77/Mo.

- Pentium® II processor 300MHz
- 14.1" XGA Active Matrix Display
- 64MB SDRAM / 512KB Secondary Cache
- 4GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- Removable 24X CD-ROM Drive & 3.5" Floppy Drive
- New ATI Rage Lt Pro 3D AGP Video w/8MB
- New ESS 3D Wavetable Surround Sound and Speakers
- New Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Corel Office Suite 8
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

T-1400 w/Pentium II processor 300MHz.....\$2499

OPTIONS: Mini-Docking Station \$149 • 2nd Lithium Ion Battery \$129 • PCMCIA NIC \$129 • Quantex Deluxe Carrying case \$99

Quantex T-1400 \$2399

Business lease: \$84/Mo.

- Pentium® II processor 266MHz
- New Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 64MB SDRAM / 512KB Secondary Cache
- 6GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- 24X Modular CD-ROM Drive & 3.5" Modular Floppy Drive
- New NeoMagic NM65 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1411 \$3299

Business lease: \$110/Mo.

- Pentium® II Processor 300MHz
- 14.1" XGA Active Matrix Display
- 128MB SDRAM / 512KB Secondary Cache
- 8GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New Removable 2X DVD-ROM Drive & 3.5" Floppy Drive
- New ATI Rage Lt Pro 3D AGP Video w/8MB
- New ESS 3D Wavetable Surround Sound and Speakers
- New Two Long-Lasting 12-Cell Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

T-1411 w/Pentium II processor 266MHz.....\$3089

Quantex T-1410 \$2699

Business lease: \$94/Mo.

- Pentium® II processor 300MHz
- New Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 80MB SDRAM / 512KB Secondary Cache
- 6GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- New NeoMagic NM65 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1411 \$2899

Business lease: \$101/Mo.

- Pentium® II Processor 300MHz
- New Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 96MB SDRAM / 512KB Secondary Cache
- 6GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- New NeoMagic NM65 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Two Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components



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VISIT WWW.QUANTEX.COM/PCMAG

VALUE MULTIMEDIA

QP6/333 M-1c \$1099

Business lease: \$39/Mo.

- Intel® Celeron® Processor 333MHz
- 64MB SDRAM Memory / 128KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- 64-Bit 3D AGP Graphics Accelerator with 4MB
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/333 M-1c(with Pentium II processor).....\$1149

QP6/350 M-1x(with Pentium II processor).....\$1199

QP6/350 M-1x with Pentium II processor, 17" Monitor, and Intel740 3D 2X AGP Graphics w/8MB.....\$1299

SOFTWARE: Corel Office Suite 8 • Internet the City • Compton's Interactive Encyclopedia • Body Works 6.0 • Amazon Trail II • MS Money '97 (pre-loaded only) American Heritage Talking Dictionary • Dr. Solomons Find-Virus (pre-loaded only) • Compton's Reference Collection • MS Internet Explorer 4.0

QP6/350 M-2x \$1399

Business lease: \$49/Mo.

- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Toshiba MPACT2 3D Media Accelerator w/8MB VRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 M-2x(with Pentium II processor).....\$1549

QP6/450 M-2x(with Pentium II processor).....\$1749

QP6/400 M-3x \$1649

Business lease: \$58/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Toshiba MPACT2 3D Media Accelerator w/8MB VRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/350 M-3x(with Pentium II processor).....\$1499

QP6/450 M-3x(with Pentium II processor).....\$1849

QP6/450 M-4x \$1999

Business lease: \$70/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory/512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add Altac Lansing ACS-251 Subwoofer for \$39

QP6/350 M-4x(with Pentium II processor).....\$1649

QP6/400 M-4x(with Pentium II processor).....\$1799

POWER MULTIMEDIA

QP6/350 SM-1x \$1499

Business lease: \$51/Mo.

- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 98
- Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 SM-1x(with Pentium II processor).....\$1599

QP6/400 SM-1x with Pentium II processor, 10.2GB HD, and 3rd-Generation 4.8X DVD-ROM Drive.....\$1699

SOFTWARE: MS Office '97 Small Business Edition v2.0 • MS Money '97 (pre-loaded only) • Office Mate • Day Planner Pro • Power Business Plans • Form Designer Pro • Project Manager Pro • Labels Unlimited • Compton's Reference Collection • Dr. Solomons Find Virus (pre-loaded only) • MS Internet Explorer 4.0

QP6/400 SM-2x \$1799

Business lease: \$63/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/350 SM-2x(with Pentium II processor).....\$1649

QP6/450 SM-2x(with Pentium II processor).....\$1999

QP6/400 SM-3x \$2099

Business lease: \$74/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to #9 Revolution IV AGP Video w/32MB for \$49

QP6/350 SM-3x(with Pentium II processor).....\$1949

QP6/450 SM-3x(with Pentium II processor).....\$2299

QP6/450 SM-4x \$2399

Business lease: \$84/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- New 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- New Altac-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to #9 Revolution IV AGP Video w/32MB for \$49

QP6/400 SM-4x(with Pentium II processor).....\$2199

SUPER MULTIMEDIA

QP6/450 M-4x SE \$2149

Business lease: \$77/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add Altac Lansing ACS-251 Subwoofer for \$39
- Upgrade to 21" Monitor (20.0" viewable) for \$349

QP6/400 M-4x SE(with Pentium II processor).....\$1949

QP6/450 SM-4x SE \$2799

Business lease: \$98/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 21" Monitor w/OSD (20.0" viewable), 1600x1200
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- New Altac-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to 15.0" LCD Flat-Panel Display for \$149

QP6/400 SM-4x SE(with Pentium II processor).....\$2599

M-SERIES BEST BUY

QP6/450 Best Buy \$1999

Business lease: \$70/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10.2GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB Based on award-Winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altac-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add an Internal Zip Drive for \$79

GAMING BEST BUY

QP6/450 GX-2 \$2399

Business lease: \$84/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- Aural® A30 3D Positional PCI Sound
- 3Dfx Voodoo2 based 3D Game Accelerator w/12MB
- MS SideWinder Precision Pro Joystick
- New Altac-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers & subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- Activation Game Titles: Battlezone, Heavy Gear Interstate 75 w/Nitro Pack
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 GX-2(with Pentium II processor).....\$2199



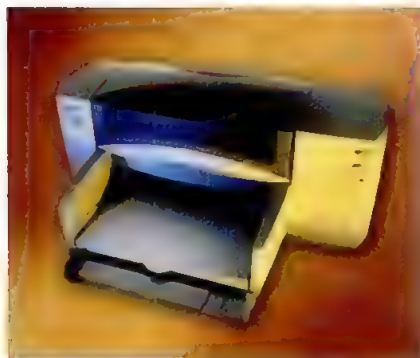
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Peripherals BEST of 1998



HP DeskJet 895Cse

Targeting small-business and home-office users, the HP DeskJet 895Cse (\$400 street) is the best all-around ink jet printer we saw this year. It combines class-leading ink technologies with fast print speeds. The 895Cse uses two ink technologies that HP has been developing for several years, resulting in crisp, dark text and rich, detailed photo prints. The unit prints on a variety of media and comes equipped with a USB port. **Hewlett-Packard Co.**, Santa Clara, CA; 800-752-0900; www.hp.com (ORS 527).

Toshiba TekBright 50D

The 15-inch Toshiba TekBright 50D is the best of the new breed of XGA-resolution LCD monitors. Using PanelLink digital technology, its proprietary PCI graphics adapter card eliminates the pixel jitter and moiré patterns found with analog LCD monitors. The screen pivots so that you can use it in either portrait or landscape mode; it includes built-in stereo speakers and a microphone, plus jacks for an external speaker and mike. Even at \$1,300—twice the price of a 17-inch CRT monitor—the TekBright is a good buy.

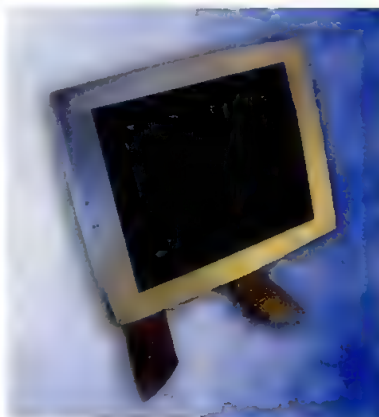
Toshiba America Inc., New York; 800-867-4422; www.csd.toshiba.com (ORS 511).

NEC MultiSync E700

When NEC Technologies introduced its ChromaClear slot-mask

CRT two years ago, we were impressed by the technology but not the image quality. But in the new NEC MultiSync E700 (\$550 street), ChromaClear produces sharp, clear images that are among the best we've seen in a 17-inch monitor. And while this monitor is suitable for

demanding graphics users, its crisp display of fine details makes it an excellent choice for text applications.



NEC Technologies, Itasca, IL; 800-632-4636; www.nectech.com (ORS 528).

Iiyama VisionMaster 450

From a price/performance standpoint, the Iiyama VisionMaster 450 (\$600 street) is the most remarkable 19-inch monitor we tested in 1998. With a top resolution of 1,600 by 1,200 (at a respectable 80-Hz refresh rate), the 450 can deliver rock-solid images for CAD, image editing, and desktop publishing, while its attractive price puts it within reach of most business users as well. The 450 displays sharp, clear images and legible type even at small point sizes.

Iiyama North America Inc., Costa Mesa, CA; 800-394-4335; www.iiyama.com (ORS 529).

NEC SuperScript 870

The NEC SuperScript 870 (\$350 street) delivers great speed and print quality at an aggressive price. Setup is simple, and the 60-MHz Adobe PrintGear processor makes the 870 one of the fastest personal lasers we tested in 1998. Text is clean and legible, even at minuscule point sizes, and graphics

output is stunning. Continuous tones are smooth and steady, and gray-scale graphics are rendered with nearly unnoticeable dither patterns.

NEC Technologies, Itasca, IL; 800-



632-4636; www.nectech.com (ORS 528).

Creative Labs Graphics Blaster RIVA TNT

The key to a graphics accelerator is a core chip that delivers a lot of bang for the buck. The Creative Labs Graphics Blaster RIVA TNT (\$170 street) uses the nVidia RIVA TNT, which delivers the best 2-D and 3-D performance we've seen in a mainstream accelerator.

Sony Digital Mavica MVC-FD81

The Sony Digital Mavica MVC-FD81 (\$800 street) is an innovative merging of PC photography and consumer A/V technology. This latest version of the Mavica lets you capture high-resolution 1,024-by-768 still images, as well as 640-by-480 images and MPEG-1 video—all saved on standard floppy disks. Using JPEG compression, you can fit up to 16 high-resolution or 40 low-resolution images on a single disk. In video-capture mode, a single disk can hold 15 seconds of 320-by-240-resolution video or 60 seconds of 160-by-112-mode video, including audio. The MVC-FD81 includes four special-effects modes, six lighting modes, a bright 2.5-inch color LCD, 3X optical zooming, and built-in audio recording. But the MVC-FD81's core capabilities, excellent image captures, and easy file transfers are what make it a real winner. • **Sony Electronics Inc.**, San Jose, CA; 800-222-7669; www.sony.com (ORS 526).

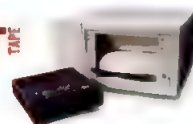




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Business is a race. But if you're not careful, your data won't make it to the finish line. So protect yourself. Look for "DLTtape™" or the authorized DLTtape logo mark on all your backup drives and media. It means you have the real thing, designed to the real DLT™ standard. It means you've got one of the fastest, most reliable, most scalable data backup systems in the business. And it means your DLTtape drive warranty won't go head over heels. To find out more, visit our website at www.DLTtape.com. It could save you from a nasty headache.



Creative Labs builds on this solid base with stable drivers and user-friendly utilities.

Creative Labs Inc., Milpitas, CA; 800-998-5227; www.creativelabs.com (ORS 530).

HP ScanJet 6200C

Business users who need a flatbed scanner to deliver top-quality scans with minimal hassle should look no further than the HP ScanJet 6200C (\$400 street), the best all-around scanner we tested in 1998. The 36-bit 6200C delivers excellent scan quality with vibrant and accurate colors. And thanks to the 600-by-1,200 optical resolution, images retain a remarkable amount of detail. The 6200C's driver offers automation intelligence that lets novice users simply click and scan while giving ad-



vanced users full control.

Hewlett-Packard Co., Santa Clara, CA; 800-722-6538; www.hp.com/go/scanjet (ORS 527).

Creative Labs PC-DVD RAM

After seemingly endless delays and unmet promises, DVD-RAM drives have finally arrived, and Creative Labs was the first to bring one to market. For \$499.99 (direct), the Creative Labs PC-DVD RAM removable drive provides an enormous capacity, media that cost under a penny per megabyte, and backward compatibility with other formats. The big draw, however, is the DVD-RAM medium, which can hold 4.6GB of data (formatted).

Creative Labs Inc., Milpitas, CA; 800-998-1000; www.soundblaster.com (ORS 530).

Matrox Marvel

G200-TV

The Matrox Marvel G200-TV (\$300 street) combines sizzling graphics performance with high-quality video capturing and the most intuitive video editor on the market. The Marvel ships with Avid Cinema, a video-editing package that provides storyboard templates for common business and home user projects. As a graphics accelerator, the Marvel handles home and business graphics chores with aplomb. And Matrox's graphics utilities are polished, feature-rich, and stable.

Matrox Graphics Inc., Dorval, Quebec; 800-361-1408; www.matrox.com/mga (ORS 532).

Smart and Friendly CD Rocket

The Smart and Friendly CD Rocket (\$1,000 street) is the fastest SCSI CD-R drive we've seen yet, writing CDs at 8X and reading them at

20X. The CD Rocket comes equipped with an Adaptec PCI SCSI adapter, Adaptec's utility collection EZ-SCSI, and the easy-to-use CD-mastering software NTI CD-Maker. Also included are Sonic Foundry's CD Architect and Sound



Forge XP for editing audio files and Diamond Cut Audio Restoration Tools 32, which can automatically filter out noise from analog sources.

Smart and Friendly Inc., Chatsworth, CA; 800-959-7001; www.smartandfriendly.com (ORS 533).

Epson PowerLite 5500C

The hottest news in data projectors is the booming market in sub-10-pound ultraportables. And the brightest star in the group is the new 9.4-pound Epson PowerLite 5500C, from Epson America. With a list price of \$7,499, this Super VGA-resolution projector is brighter and better than most units that weigh twice as much. And though the projector is light enough to take on any road trip, it comes with a manual zoom lens and a remote control.

Epson America Inc., Torrance, CA; 800-463-7766; www.epson.com (ORS 534).

Tektronix Phaser 740L

The Tektronix Phaser 740L (\$1,500 street) is a 16-ppm monochrome laser printer that can be upgraded to a quality 5-ppm color laser. As a monochrome network laser, the Ethernet-equipped Phaser 740L delivers the speed, quality output, and paper-handling options that business users need; as a color laser (\$550 upgrade) it produces stunning output.

Tektronix Inc., Wilsonville, OR; 800-835-6100; www.tek.com/color_printers (ORS 535).

BEST of Service & Reliability

Two of the best-known printer manufacturers came out on top with grades of A in our annual Service and Reliability Survey focusing on hardware (July 1998).

→ Epson

→ Hewlett-Packard



MY FAVORITES OF '98

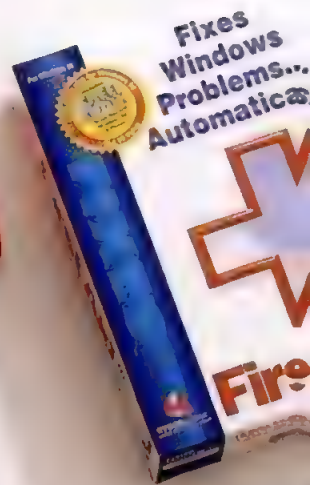
For an unreconstructed hardware junkie like me, 1998 was a wonderful year. We saw the first USB devices and inexpensive digital video editors; digital cameras achieved useful resolutions at reasonable prices; there's no shortage of removable storage options; and everybody I know started toting a 3Com PalmPilot. I love them all. But here are a few highlights.

One of the standouts is the U.are.U biometric fingerprint scanner. This digital fingerprint scanner and its software replace your password dialog boxes. It works every time, and it can foil even your worst enemies. The U.are.U will reject your finger if it doesn't have a pulse.

The peripheral that you probably don't need but everybody thinks is cool is Roland Digital's Modela modeling system. Billed as a "3D plotter," the Modela is actually a tabletop, computer-controlled milling machine that can take shapes created in any CAD program and turn them into foam, plastic, wax, or wood models—perfect for producing mock-ups, molds, models, and even 3-D signs.

My absolute favorite peripheral, however, is the new class of superlight, superbright video projectors, ably represented by the InFocus LP425. It uses a digital light processor—mirrors on a memory chip—instead of an LCD to project a crisp, saturated image. The LP425 lacks some of the bells and whistles offered by our selection for the Best of 1998, the Epson PowerLite 5500C. But at 6.8 pounds, you can throw it in your computer bag and turn any conference room into your personal multimedia theater.

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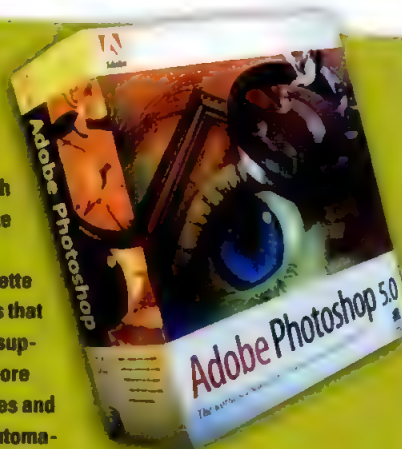


Software BEST of 1998

Adobe Photoshop 5.0

Adobe has been accused of resting on its laurels with Photoshop, the standard image-editing tool of design professionals everywhere. But this year Adobe put the complaints to rest with the release of Adobe Photoshop 5.0 (\$650 street), a major update of its flagship photo editor that adds features long sought by Photoshop users. The list of new features is long: a History Palette for multiple levels of undo; Layer Effects such as drop shadows that remain fully editable; vastly improved text features, including support for vertical text; a magnetic lasso for making selections more quickly; support for ICC (International Color Consortium) profiles and spot color; and an Actions plug-in architecture for improved automation. These new features make Photoshop 5.0 a must-have upgrade.

• **Adobe Systems Inc.**, San Jose, CA; 800-492-3623; www.adobe.com (ORS 517).



Center (SARC) from directly within the program.

Symantec Corp., Cupertino, CA; 800-441-7234; www.symantec.com (ORS 521).

Macromedia Flash 3

Macromedia's Flash has become the de facto standard for vector graphics on the Web. Macromedia Flash 3 (\$300 street), the latest release of Macromedia's Flash design tool, makes creating multimedia content for the Web even easier by adding features such as shape tweening (or morphing) and support for transparency. You can add animation, interactive effects, and sound to your work, then save it not only in Flash file format but also in even more universal formats such as Java, animated GIF,



Trellix 2.0

Any application that can make sense of the voluminous Ken Starr report clearly has something going for it (www.gooddocuments.com/icreport). That's just the sort of task that Trellix 2.0 (\$249 direct) is designed to tackle. An intranet authoring application, Trellix 2.0 combines elements of a word processor, presentation graphics program, and Web authoring tool to help business users create long documents that are well organized, easy to update, and accessible to anyone with a Web browser.

Trellix Corp., Waltham, MA; 781-788-9400; www.trellix.com (ORS 518).

Microsoft Publisher 98

The desktop publishing application for those of us without degrees in design, Microsoft Publisher 98 (\$100 street) is geared toward

home and SOHO users. Based on an extensive library of wizards and design templates, Publisher 98 lets anyone create brochures, newsletters, business cards, and much more with professional results. The program steps you through the design process with a series of wizards, and you can always go back and make changes to your project.

Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com (ORS 519).

Macromedia Fireworks 1.0

In the world of design software, 1998 will be remembered as the year of Web graphics, and the best of the many new tools in this nascent category is Macromedia Fireworks (\$300 street). At its most

basic, Fireworks lets you optimize images for the Web by fine-tuning color palettes and other settings and exporting them as GIF, JPEG, or PNG files. But Fireworks is much more than an image optimization utility. It offers all the standard image-editing and illustration tools, so you can create animation, JavaScript rollovers, and image maps and slice a single image into segments.

Macromedia Inc., San Francisco; 800-888-9335; www.macromedia.com (ORS 520).

Norton AntiVirus 5.0

In our annual Utility Guide (March 24, 1998), Norton AntiVirus (NAV) 4.0, from Symantec Corp., received an Editors' Choice award for packaging comprehensive virus protection in an easy-to-use interface. Since then, Symantec has released NAV 5.0 (\$50 street). This latest version adds several new features, including the ability to quarantine questionable files so they won't damage your system, enhanced support for compressed file formats, and the ability to submit files for analysis to the Symantec AntiVirus Research



and RealMedia. Macromedia has also furthered the reach of Flash by providing a standalone player that you can distribute with your files.

Macromedia Inc., San Francisco; 800-470-7211; www.macromedia.com (ORS 520).

CleanSweep Deluxe

For \$50 (street), Quarterdeck's CleanSweep Deluxe stands clearly ahead of the pack, combining speed, power, and safety. The tabbed interface is very intuitive and places many options in plain view. You can remove, archive, and move applications, as well as





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Forward-looking technologies that are usable today. • Like super fast modems, affordable videoconferencing, color fax machines and TVs that think they're computers. • We're uniquely qualified to chart the future of communications electronics. • We were doing it even before there were personal computers. In other words, we know what's next. Because we're there today.



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What's next in communications technologies.

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**KINGSTON SERVER MEMORY.
DESIGNED TO TAKE ALL KINDS OF ABUSE.**

THE HUMIDITY TEST.

*Determines if modules can survive
the worst environments.*



THE FULL SPECIFICATION TEST.

*A brutal gamut of tests designed to
isolate the most subtle flaws.*

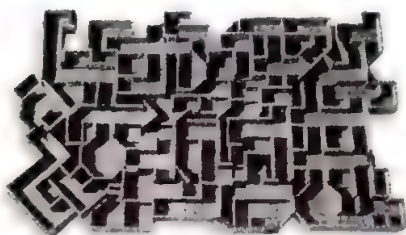


THE STRESS TEST.

*Subjects modules to extreme stress for up to 1,000 hours.
Only the strongest survive.*



THE DYNAMIC BURN-IN PROCESS. A series of extreme temperature cycles simulate the worst conditions.



THE COMPONENT SCREENING PROCESS.

Only the finest chips and components make it through.

THE SIGNAL INTEGRITY TEST.

Ensures all electrical signals reach their destination flawlessly.



THE COMPATIBILITY TEST.

*Every new design is tested in the system
environment it will be used in.*

THE WORLD'S MOST RELIABLE MEMORY. At up to 50% less than the server manufacturers' Kingston® server memory has survived conditions far worse than anything you'd find inside the most mission-critical server. To ensure compatibility, it's customized to meet the requirements of the server or class of servers in which it will be used. Yet it costs considerably less, and comes with a lifetime warranty. Why? Find out at www.kingston.com/server. Or call us at (800) 337-3807.

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1998 EDITORS' CHOICE GALLERY

The Year in Review



AS EDITORS OF *PC MAGAZINE*, we're constantly being asked to recommend a new notebook PC, personal ink jet printer, office suite—you name it. Well, you asked for it, you've got it. In this special section, we've assembled a complete list of every product that received an Editors' Choice award in 1998—130 PCs, Internet sites and software, peripherals, desktop applications, and networking products in all.

The Best of 1998 story in this issue honors a handful of the most outstanding products, but it represents only a fraction of those that actually earned our Editors' Choice recommendation. In fact, helping you choose the best products is something we do day in and day out. In 1998, *PC Magazine* reviewed thousands of products, from workstations to Windows CE devices and Web servers to portals, as well as a broad array

of peripherals, applications, and networking products. This Editors' Choice Gallery recaps all of these comparative reviews and identifies those products that rose to the top on our tests in PC Magazine Labs.

Note that not all of the products recognized in our Best of 1998 story also appear on this Editors' Choice list—some shipped too late to find their way into a feature story but nonetheless deserve accolades for raising the bar in their categories. For example, the Toshiba Tecra 8000 received this year's award for the best high-end notebook, even though it shipped too late to be included in our August 1998 roundup of portables.

There's one thing of which you can be certain: The products listed in these pages represent the very best that the computing industry had to offer in 1998. We expect nothing less in the coming year.

excite

Excite offers the features and content to persuade you to hang around for a while. Just enter your ZIP code and e-mail address and you've got a personal Web portal.

PERIPHERALS



The Epson PowerLite 1500C is an ultraportable projector with big-projector features including a bright, Super VGA image, zoom lens, and remote control.

Epson PowerLite



HP DeskJet 8850C

Based on Hewlett-Packard's new ink technology, the HP DeskJet 8850C delivers crisp and vibrant images at a price that will appeal to SOHO users.

James 2.1
Lotus BeamMachine for Java 1.1
Microsoft JVM for Windows
Sysbase PowerJ Enterprise 2.1
Astound Dynamite
Log Analyzer
Microsoft Site Server 2.0
HomeSite 3.0
Microsoft FrontPage 98

GRAPHICS ACCELERATORS

Creative Labs Graphics Blaster Riva TNT
Matrox Millennium G200
Creative Labs Sound Blaster AWE64 Gold

PRINTERS AND MULTIFUNCTION DEVICES

Brother MFC-7100
Epson Stylus Color 440
HP DeskJet 8850C
NEC SuperScript 870
IBM InfoPrint 20
Lexmark Optra S1655n
QMS ImagoPrint 2 CX
Xerox DocuPrint N32

SCANNERS

Epson Expression 636 Analyst 2
HP ScanJet 6200C
Visioneer FastFlow Color

MONITORS

EIZO Nanao FlexScan TX C7
Sanyo VisionMaster
NEC MultiSync E700
Nokia 4430pro
Optquest V96

DIGITAL CAMERAS

Agfa ePhoto 1280
Canon PowerShot 350
Eastman Kodak D5 DC210 Zoom Camera
Kodak Q-mount
Olympus D-500

OTHER PERIPHERALS

Epson PowerLite 6500C
Epson PowerLite 7250
In Focus LP420
Imaging TrioPlus
SyQuest SparQ 1.0 GB
Video Spinix Pro
Philips OMNIV12
Smart and Friendly CD-R 400s Deluxe
Altec Lansing ACS48
Cambridge SoundWorks

Interleaf Inc.
Lotus Development Corp.
Microsoft Corp.
Sysbase Inc.
Astound Inc.
WebTrends Corp.
Microsoft Corp.
Allaire Corp.
Microsoft Corp.

www.interleaf.com
www.lotus.com
www.microsoft.com
www.sysbase.com
www.astound.com
www.webtrends.com
www.microsoft.com
www.allaire.com
www.microsoft.com

Creative Labs Inc.
Matrox Electronic Systems Ltd.
Creative Labs Inc.

www.soundblaster.com
www.matrox.com
www.soundblaster.com

Brother International Corp.
Epson America Inc.
Hewlett-Packard Co.
NEC Technologies Inc.
IBM Printing Systems Co.
Lexmark International Inc.
QMS Inc.
Xerox Corp.

www.brother.com
www.epson.com
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www.qms.com
xerox.networkprinters.com

Epson America Inc.
Hewlett-Packard Co.
Visioneer Inc.

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www.visioneer.com

EIZO Nanao Technologies Inc.
Iiyama North America Inc.
NEC Technologies Inc.
Nokia Display Products Inc.
Optquest Corp.

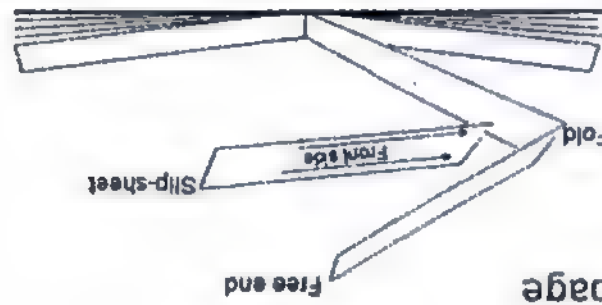
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Eastman Kodak Co.
Kodak U.S.A. Inc.
Olympus America Inc.

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www.olympus.com

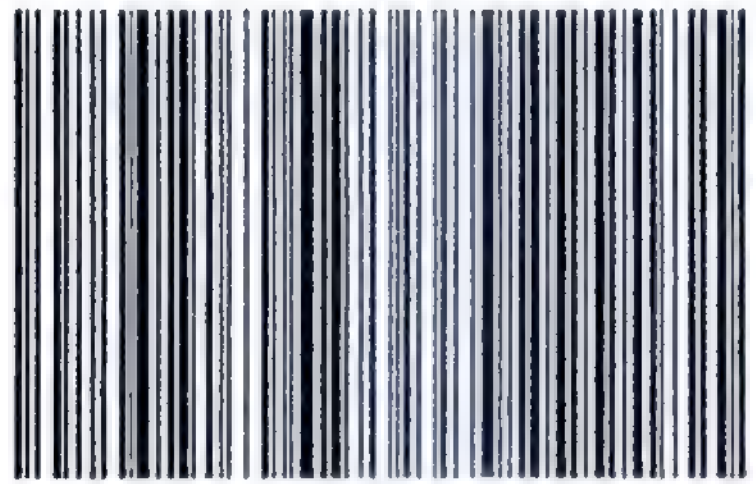
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Imaging TrioPlus
SyQuest Technology Inc.
FutureTel Inc.
Philips Components
Smart and Friendly Inc.
Altec Lansing Technologies Inc.
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www.hifi.com



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2. Insert this sheet with
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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet

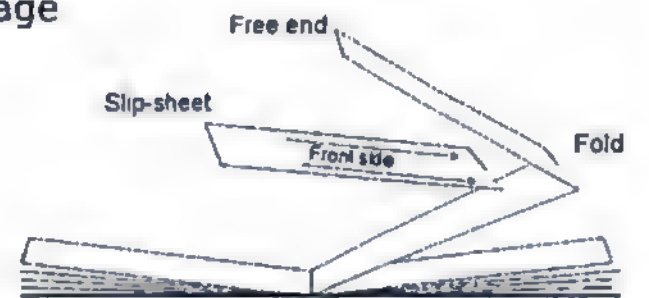


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Foldout slip-sheet

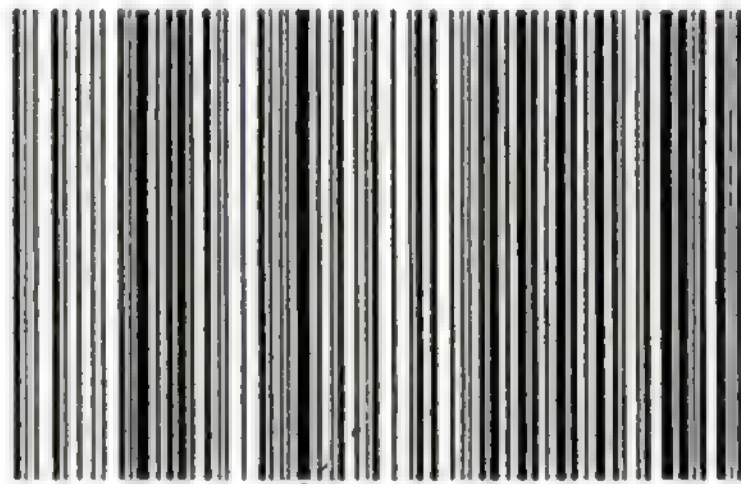
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 2. Arrow pointing to the fold
3. Slice the folded edge
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1. Follow instructions on the other side

Inverted Back

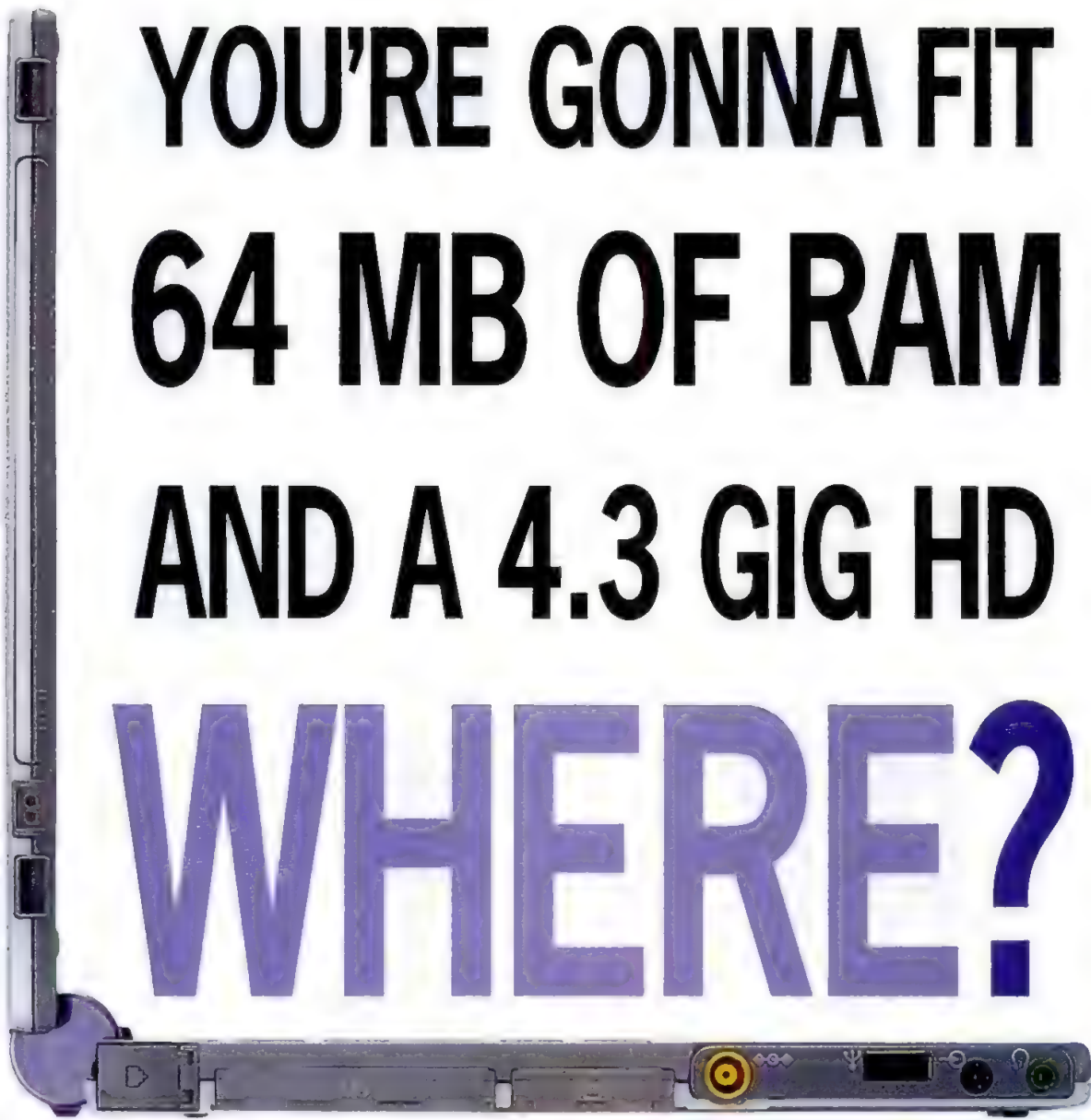


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Back

1. Follow instructions on the other side

YOU'RE GONNA FIT 64 MB OF RAM AND A 4.3 GIG HD WHERE?



THE VAIO® 505 SUPERSLIM NOTEBOOK. UNDER 3 LBS. AND LESS THAN 1" THIN.

Where there's a will, there's a Sony design team. Their latest

achievement wouldn't be so extraordinary if it weren't so powerful

and so light. Inside its tough magnesium-alloy case, you'll find some notable innovations. The

Programmable Power Key short-cuts you to most-used functions like e-mail or browsers

without having to close down the file you're in. **i.LINK™** gives you a port for

capturing digital video. And **Signature Capture** lets you add your John Hancock

to original works or documents. What else do you need to seal the deal—how

about an Intel® Pentium® processor with MMX™ technology 266 MHz?

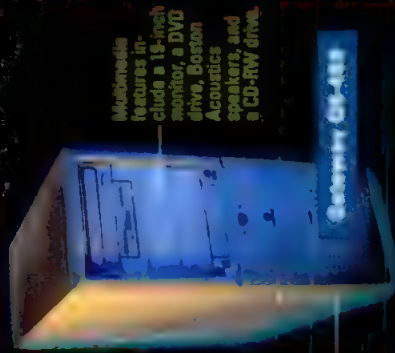


1998 Editors' Choice Gallery

PCs

A PC for pros, the G4-450 is built on a 450-MHz Pentium II chip with 128MB RAM, a 4GB hard disk, and a top-notch graphics accelerator.

The G4-450's sleek free case and loads of expansion space give you room to grow.



Gateway G4-450

MediaPlus features include a 15-inch monitor, a DVD drive, Boston Acoustics speakers, and a CD-RW drive.

The 12.1-inch TFT display is clear and bright, and you get a full audio system.



IBM ThinkPad 560

In a 4-pound package, the latest incarnation of the ThinkPad 560 boasts a 300-MHz Pentium II processor, 64MB RAM, and a 3.4GB hard disk.

INTERNET



Northern Light

The ultimate destination for serious site searchers, Northern Light has advanced search features that consistently yield relevant hits. And the site conveniently organizes your search results.

The best place to start on the Web.

PRODUCT NAME

BUSINESS PCs

Compaq Deskpro EL 4400

HP Vectra VE Series B

HP Vectra VL Series B HE

NOTEBOOK PCs

Gateway Solo 2500SE

Gateway Solo 9100L

IBM ThinkPad 560X

IBM ThinkPad 600

NEC Versa LX

Gateway Solo 2100

IBM ThinkPad 770

NEC Versa 6230

PROFESSIONAL AND HOME PCs

Dell Dimension XPS R450

Gateway G6-400

Asus Orion LXN206

Gateway G6-400

Dell Dimension XPS 7333

HP Vectra VL 7/333

OTHER PCs

HP Net Vectra

Neoware @workStation Supra-86

Franklin Box 3-DOS PC Companion

Palmtop Series B Handheld Computer

3Com PalmPilot Professional

Intergraph TDZ 2000 3D Workstation

SITES

Ask Jeeves for Kids

MetaCrawler

Northern Light

Yahool!

Amazon.com

CDnow

Chumby.com

NEC

NetMarket

Excite

Cadmus.com

Excite.com

SOFTWARE

Microsoft Outlook Express 4.5

Microsoft Outlook 98

Northern Light Enterprise Server 3.5.1

COMPANY NAME

Compaq Computer Corp.

Hewlett-Packard Co.

Hewlett-Packard Co.

Gateway

Gateway

IBM Corp.

IBM Corp.

NEC USA Inc.

Gateway

IBM Corp.

NEC USA Inc.

Dell Computer Corp.

Gateway

Gateway

Asus Systems

Gateway

Dell Computer Corp.

Hewlett-Packard Co.

Hewlett-Packard Co.

Neoware Systems Inc.

Franklin Electronic Publishers Inc.

Palmtop Inc.

3Com Corp.

Intergraph Computer Systems

Ask Jeeves Inc.

go2net Inc.

Northern Light Technology LLC

Yahool! Inc.

Amazon.com Inc.

CDnow Inc.

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PCG-505FX

- Intel Pentium processor with MMX technology 266 MHz
- 10.4" Active Matrix SVGA Display (800 x 600 resolution)
- 64 MB SDRAM (expandable to 96 MB)
- 4.3 GB hard drive
- V.90 modem
- 128-bit graphics accelerator
- Windows® 98 pre-installed
- Programmable power key
- Touch pad with pen operation
- i.LINK (IEEE-1394) port for digital video still image capture
- Price includes accessories: AC adapter, rechargeable battery, floppy disk drive, port replicator

\$1,999⁹⁹ Monthly payments as low as \$36.69*

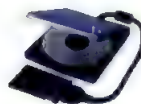
PCG-505F

- Intel Pentium processor with MMX technology 233 MHz
- 10.4" Active Matrix SVGA Display (800 x 600 resolution)
- 32 MB SDRAM (expandable to 96 MB)
- 4.3 GB hard drive
- V.90 modem
- 128-bit graphics accelerator
- Windows 98 pre-installed
- Programmable power key
- Touch pad with pen operation
- Price includes accessories: AC adapter, rechargeable battery, floppy disk drive, port replicator

\$1,699⁹⁹ Monthly payments as low as \$31.19*

OPTIONAL ACCESSORIES

CD-ROM drive



Slim, color-coordinated 14X CD-ROM drive for serious multi-media capability. Or listen to CDs with headphones.

PCGA-CD: \$299.99

Stereo speakers



Just clip these speakers on both sides of the display panel for enhanced sound performance.

PCGA-SP5: \$99.99

Rechargeable battery pack (LG)



Double the time you can spend on your SuperSlim Notebook with this double capacity Lithium-Ion battery.

PCGA-BP52: \$299.99

AC adapter



Just plug it into your VAIO 505 SuperSlim Notebook and forget all your concerns about battery life.

PCGA-AC51: \$99.99

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The Sony IC Chip Recorder

Welcome to Sony VAIO Direct.

It's where video, audio and computing converge into stunning digital integration.

Because Sony VAIO Notebooks are designed to work with the ever-expanding line of Sony audio/video products.

Take the ingenious Sony IC Chip Recorder. This palm-sized device (2.5 oz.) records voices with digital clarity. Record important meetings. Download, save and e-mail voice messages and memos using your Sony VAIO Notebook. Holds up to 24 minutes of recordings.

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VAIO® PCV-E308DS

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- Intel® Pentium® II processor 450 MHz
- 128 MB SDRAM (expandable to 256 MB)
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- i.LINK (IEEE-1394), Optical Digital Audio Out, and S-Link technology (Control A-1)



- Front accessible i.LINK (IEEE-1394), and USB connectors
- 2X AGP 3D graphics hardware acceleration (Matrox G200)
- 8 MB video memory (SDRAM)
- Dynamic high-fidelity 3D PCI audio
- V.90 compatible modem

VAIO PCV-E302DS

\$1,499.99 As low as \$27.52 a month*

- Intel Pentium II processor 350 MHz
- 64 MB SDRAM (expandable to 256 MB)
- 10.2 GB hard drive
- 5X DVD-ROM/24X CD-ROM (max. performance)
- i.LINK (IEEE-1394), Optical Digital Audio Out, and S-Link technology (Control A-1)



- Front accessible i.LINK (IEEE-1394), and USB connectors
- 2X AGP 3D graphics hardware acceleration (Matrox G200)
- 8 MB video memory (SDRAM)
- Dynamic high-fidelity 3D PCI audio
- V.90 compatible modem

INSTALLED SOFTWARE

Sony Original Software

- **Picture Gear™**—Organize your digital images and stitch them together seamlessly to create a perfect panorama.
- **DVgate™ Still**—Captures high-quality still images from video and stores them in BMP, JPEG, GIF or DVF format.
- **DVgate Motion**—Sony's digital video editing software that allows you to transfer and edit digital video from Sony's Digital Handycam Camcorder to your PC via i.LINK (IEEE-1394) technology.

- **Digital Media Park™**—Gives you an easy way to manage and make your own customized MiniDisc recordings.

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- Microsoft Money 98
- Gremlin Interactive MotorHead®



The Sony Digital Mavica® Camera

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Take the sleek Sony Digital Mavica Camera (MVC-FD81), the world's only camera that uses a floppy disk as film. Add images or capture short MPEG1 videos for multi-media presentations on your Sony VAIO PC, then e-mail them or post them to the Internet. The Mavica Camera even has a built-in microphone and speaker so you can voice-memo your shots.

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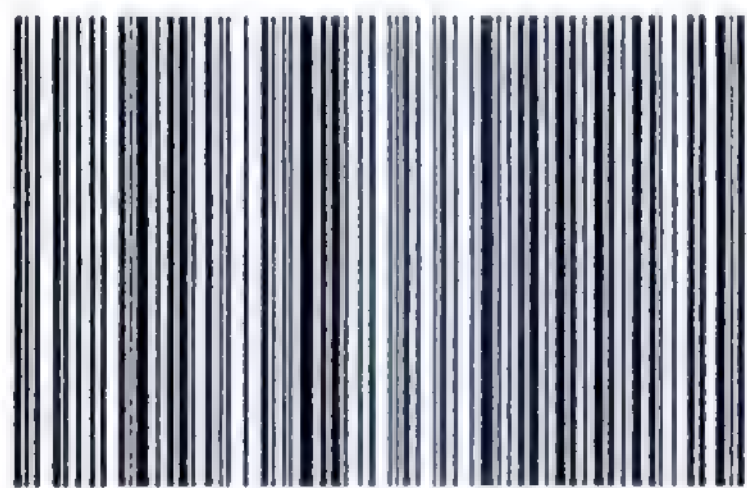
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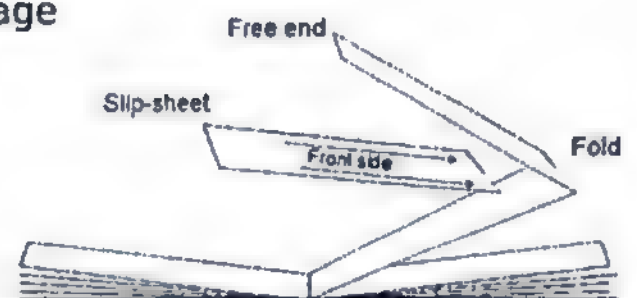
Inverted Foldout slip-sheet



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Foldout slip-sheet

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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

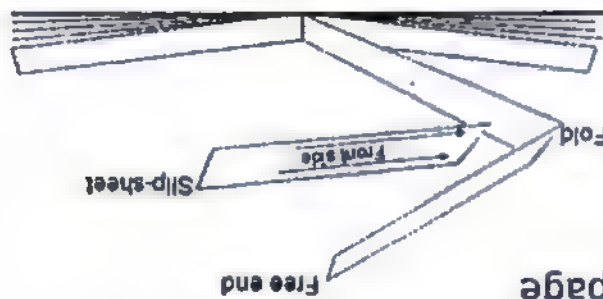
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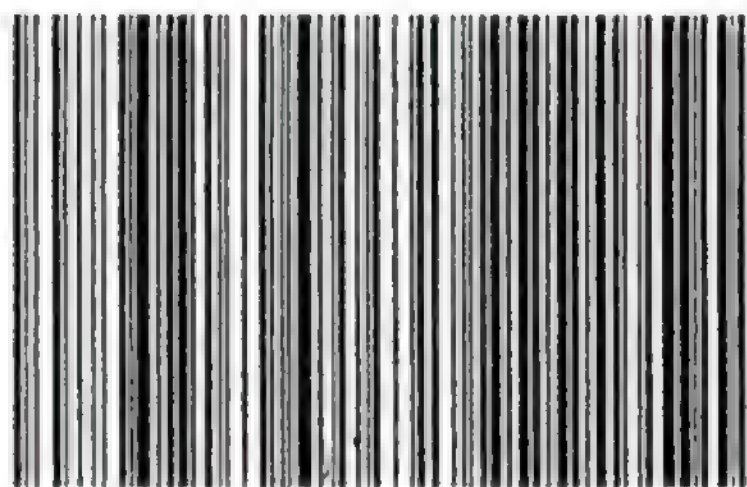
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Back

1. Follow instructions on the other side

DON'T JUST DABBLE

IN THE DIGITAL AGE.



DOMINATE IT.

Tired of dilly-dallying with the average computer? Then get a Sony VAIO Digital Studio™ PC, and discover how amazing the convergence of audio, video and computing can be. A powerhouse of a PC, it will help you do things you never thought possible. Like import digital video from your Sony Digital Handycam® Camcorder Straight to your PC, via iLINK™ technology. Edit in titles, transitions or soundtracks to create your own movies and presentations. You can even use your PC to control Sony Minidisc Decks and CD changers, creating customized MiniDiscs with synchronized recording. Thanks to Sony S-Link™ and Optical Digital Audio Out technologies. All with ease. And all with the remarkable sound and visual quality that only the Sony VAIO Digital Studio Series can deliver. Of course, if you're in the mood to dabble, just put your feet up and pop in your favorite DVD title.



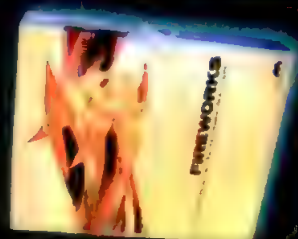
The Sony Trinitron® Multimedia Display depicted in this ad is sold separately.

SOFTWARE

The first vendor to ship a general, continuous-speech recognition product, Dragon Systems has maintained its lead with a single-minded focus on accuracy.



Macromedia made its mark in 1998 with a slew of new Web design tools including Fireworks, a feature-packed program for creating and optimizing images for the Web.



NETWORKING

A flexible hub that is loaded with management features, the Intel Express 10/100 Hub is a great choice for integrating 100-Mbps Fast Ethernet connections into your existing network.



The 3Com Megahertz 56K Global Modem PC Card lives up to its name. The card is certified for use in 24 countries, and it delivers fast, reliable performance—even on degraded lines.



PRODUCT NAME

GRAPHICS

Ray Dream Studio 5.0
Adobe Photoshop 5.0
CorelDraw 6
Graphics Serve 6.0
PRODUCTIVITY
MerchandiseZer 2.03
Dragon NaturallySpeaking 3.0 Prof. Ed
eAnywhere 2.0
Microsoft Project 98
True BEGrid Pro 5.0
TurboTax Deluxe
HotOffice Virtual Office Service
TextBridge Pro 98

UTILITIES

Backup Exec for Windows 95
CleanSweep Deluxe
Cyber Snoop 2.07b
Data Protect 1.1
First Aid 98
Go Ahead GDI 3.01
iClean 3.01
Norton AntiVirus 4.0
NSClean 3.32
Nuts & Bolts
Quick View Plus 4.6
InstallShield Express 2
InstallShield Performance

LANtastic 4.0
Norton Desktop Plus 1.0
MidPoint Gateway 3.1
Ariseon RAIDPro XI
Isobridge Vantage 1.0
Intel PRO/100+ Server Adapter
NetGear Network Starter Kit SB 104
3Com Megahertz 56K Modem PC Card
Cobalt Cube 2/00WG
Cisco Catalyst 2801
NetGear Pro
Shiva AccessPort 2.0
Lotus Domino 4.5a with Lotus Notes
Microsoft Exchange Server 4.1
Right! AX Enterprise v5.0
Seagate Backup Exec for NetWare, Win NT
SupraShare Information Server 3.0
Intel Express 10/100 Stackable Hub
Intel NetPortExpress Pro/100
3Com NetServer 3.1
Microsoft Plus

COMPANY NAME

Macromedia Inc.
MetaCreations Corp.
Adobe Systems Inc.
Corel Corp.
Pinnacle Systems Inc.
Hyper Software Inc.
Dragon Systems Inc.
Syntac Corp.
Microsoft Corp.
Apex Software Corp.
Intel Inc.
HotOffice Technologies Inc.
ScanSoft Inc., a division of Xerox Corp.

Seagate Software Inc.
Quarterdeck Corp.
Pearl Software Inc.
eSafe Technologies Inc.
Microsoft Access Inc.
Go Ahead Software Inc.
Privacy Software Corp.
Privacy Corp.
Privacy Software Corp.
InstallShield Software Corp.
InstallShield Performance Corp.

3Com Corp.
Intel Corp.
Internet Services Inc.
MidCore Software Inc.
Ariseon Inc.
Isobridge Inc.
Intel Corp.
NetGear Inc.
3Com Corp.
Cobalt Microserve Inc.
Cisco Systems Inc.
NetGear Inc.
Shiva Corp.
Lotus Development Corp.
Microsoft Corp.
Right! AX Inc.
Seagate Software Inc.
eShare Technologies Inc.
Intel Corp.
3Com Corp.

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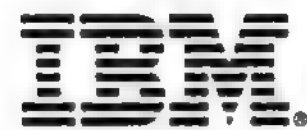
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BEST of 1998

remove files, such as browser plug-ins and cookies. And CleanSweep Deluxe properly updates your registry. But what sets CleanSweep Deluxe apart is its safety net: Red and yellow lights indicate whether removing a particular file could cause problems.

Quarterdeck Corp., Marina Del Rey, CA; 800-521-1963; www.quarterdeck.com (ORS 521).

Gizmos98

Gizmos98 (\$50 street), from Play Inc., is a suite of utilities and entertaining applets for the Windows environment. The Shredder permanently removes files from your system, protecting deleted files from recovery and undelete tactics; the Vault feature lets you

ups. The interface displays an image of a typical system, and to test a particular component, you simply click on the appropriate component in the image. Or you can check everything at once. After performing a checkup, First Aid offers an explanation and solution for each problem; you can also simply choose Auto Fix, and First Aid will take care of everything.

Network Associates Inc., Santa Clara, CA; 408-988-3832; www.cybermedia.com (ORS 523).

Microsoft Office 97 Professional Edition

Although Microsoft did not ship a new version of its omnipresent office suite in

1998, Microsoft Office 97 Professional Edition (\$600 street) handily retains its title as the best suite of productivity applications. After all, you get a suite of best-of-breed applications in a package that is tightly integrated, easy to use, and customizable and still boasts the most advanced Internet features.

Office 2000 promises more revolutionary changes,

most notably support for HTML as a "companion" file format and the ability to store and work with documents on Web servers from within Office.



encrypt files; and the Picture Explorer is a useful image management tool. But Gizmos98 adds more than just utilities. The Performer98 component lets you create multimedia presentations. There are clocks, a Prolinear CD Player, desktop themes, screen savers, and a series of photo-realistic card games. You can even create calendars and puzzles using your own images.

Play Inc., Rancho Cordova, CA; 800-306-7529; www.play.com (ORS 522).

First Aid 98

An ideal troubleshooting utility for the average user, First Aid 98 is designed mainly for resolving software conflicts but also includes features for performing hardware diagnostics and tune-

Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com (ORS 519).

Riven: The Sequel to Myst

When Broderbund released Myst in 1993, it quickly became the hot-



test-selling computer game on the market, creating quite a reputation for its sequel to match. Riven (\$40 street), from Mindscape, has surpassed expectations. The plot of Riven picks up where Myst left off. If that isn't enough to keep you interested in the game, the sheer experience of exploring this strange world should be. Full-motion video, gorgeous scenery, high-quality atmospheric sounds, and well-integrated, challenging puzzles enhance a compelling story line.

Mindscape Inc., Novato, CA; 800-567-2610; www.redorb.com (ORS 524).

Quake II

As a lone Marine struggling to survive among an alien race called Strogg, you have to rely on your quick trigger finger and ability to evade the enemy in id Software's Quake II (\$50 street). Without a doubt one of the best action games ever developed, Quake II continues to draw legions of fans into its single and multiplayer matches. Its revolutionary graphics engine brings a depth to game play previously unknown in the action genre.

Activision Inc., Santa Monica, CA; 800-434-2637; www.idsoftware.com (ORS 525).

BEST of Support & Satisfaction

No big surprises here. In our annual survey on Software Support and Satisfaction (July 1998), readers said they would most recommend the following office suites:

- Microsoft Office 97
- Corel WordPerfect Suite 8

JIM SEYMOUR



MY FAVORITES OF '98

The best new programs of 1998 were not new programs at all but upgrades. No doubt this says something about the growing maturity of the mainstream PC software market, but nevertheless these major upgrades introduced a lot of exciting new functionality to the desktop.

Dragon NaturallySpeaking 3.0 Preferred Edition, the early leader in the category of continuous-speech recognition, remains the one to beat in a surprisingly hot market. In 1998, Dragon Systems focused on better accuracy, better integration with standard Windows apps, and ease of use. It succeeded on all three counts.

After snoozing for a few years, Adobe finally got serious about Photoshop upgrades. Adobe Photoshop 5.0 features much better

text handling, undo for grown-ups, and easier and more precise compositing of multiple images. For a do-it-all professional toolbox, Photoshop remains on top.

Last year, Microsoft Money 98 lapped Quicken. This year Quicken has pulled ahead again, offering even more Web integration and an emphasis on quick data entry and one-step downloads from multiple accounts.

These days, burning CD-Rs is about as esoteric as copying a floppy disk, thanks to Adaptec's Easy CD Creator Deluxe 3.5. The latest version includes major improvements to Spin Doctor, for audio CD recording and makes it easy to build photo libraries.

Finally, here are my picks for 1998's top utilities: Backup Exec, CleanSweep Deluxe 4.1, Norton AntiVirus 5.0, and Partition Magic 4.0.

"Last year Microsoft Money 98 lapped Quicken 98, but this year Quicken has pulled ahead again."

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and Micron Electronics**

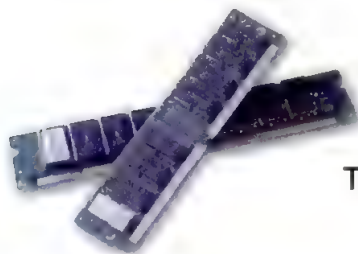
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E-3000 Series 200, 233	\$299.96	\$139.96	\$ 69.96
E-3100 Series	\$299.96	\$139.96	\$ 69.96
Family PC P5-133, -150, -166	\$359.96	\$179.96	\$ 91.96
G5-166, -200	N/A	\$151.96	\$ 75.96
G6-150, G6-200	\$359.96	\$179.96	\$ 91.96
G6-233 Best Buy and G6-233 Home Essentials	\$299.96	\$139.96	\$ 69.96
G6-266, G6-233	\$299.96	\$139.96	\$ 69.96
G6-300XL	\$299.96	\$139.96	\$ 69.96
G6-333, G6-300	\$299.96	\$139.96	\$ 69.96
GP6-300, GP6-300-2	\$299.96	\$139.96	\$ 69.96
P5-120, P5-120 XL, P5-133, P5-133 XL	\$359.96	\$179.96	\$119.96
P5-150, P5-150 XL, P5-166, P5-166 XL	\$359.96	\$179.96	\$ 91.96
P5-200 XL	N/A	\$151.96	\$ 75.96
P5-60, P5-66, P5-75, P5-90	\$399.96	\$199.96	\$119.96
P5-90 XL, P5-100 XL	\$399.96	\$199.96	\$119.96
Professional PC G6-200, G6-200 XL	\$359.96	\$179.96	\$ 91.96

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HP			
Kayak XA PC Workstation	\$299.96	\$139.96	\$ 69.96
LaserJet 4000, 5000, 8000 Series	N/A	\$179.96	\$ 69.96
LaserJet 5P	N/A	N/A	\$119.96
Pavilion 3100 Series	N/A	\$139.96	\$ 69.96
Pavilion 5030, 5040, 5120	\$359.96	\$179.96	\$ 91.96
Pavilion 7050, 7055, 7070, 7090	\$399.96	\$199.96	\$119.96
Pavilion 7110Z, 7120, 7125	\$359.96	\$179.96	\$ 91.96
Pavilion 7270, 7280P	\$359.96	\$179.96	\$ 91.96
Pavilion 8160, 8140, 8130	\$359.96	\$179.96	\$ 91.96
Pavilion 8180, 8175, 8176	\$359.96	\$179.96	\$ 91.96
Pavilion 8190, 8240, 8246, 8280, 8275, 8260	\$299.96	\$139.96	\$ 69.96
Pavilion 8290	\$299.96	\$139.96	\$ 69.96
Vectra VL 5/xxx Series 3 PC	\$399.96	\$199.96	\$119.96
Vectra VL 5/xxx MT Series 4 PC	\$359.96	\$179.96	\$ 91.96
Vectra VL 5/xxx Series 4 PC	\$399.96	\$179.96	\$ 91.96

	128MB Upgrades	64MB Upgrades	32MB Upgrades
Apple			
iMac	\$399.96	\$199.96	\$ 99.96
Mac LC III	N/A	\$199.96	\$ 99.96
Performa 5400, 6360, 6400	N/A	\$231.96	\$115.96
Performa 6110CD, 6112CD, 6115CD	N/A	\$199.96	\$119.96
Performa 6116CD, 6117CD, 6118CD	N/A	\$199.96	\$119.96
Performa 6200, 6300	N/A	\$199.96	\$119.96
Power Mac 5200/75 LC, 5260, 5300	N/A	\$199.96	\$ 99.96
Power Mac 5500 Series	\$279.96	\$139.96	\$ 79.96
Power Mac 6100 Series	N/A	\$199.96	\$119.96
Power Mac 7100, 8100 Series	\$399.96	\$199.96	\$119.96
Power Mac 7200/75/90	\$463.96	\$231.96	\$115.96
Power Mac 7500, 7600, 8500	\$463.96	\$231.96	\$115.96
Power Mac 9500 Series	\$463.96	\$231.96	\$115.96
Power Mac G3 Series (M6141LL/A, M6202LL/A) Gossamer	\$299.96	\$139.96	\$ 69.96
Power Mac G3 Series (M6142LL/A) Gossamer	\$299.96	\$139.96	\$ 69.96

Micron Electronics

	128MB Upgrades	64MB Upgrades	32MB Upgrades
Client Pro MTA P133, P166, P200	\$399.96	\$179.96	\$ 91.96
Client Pro P100, P120, P133, P150, P166, P200	\$359.96	\$179.96	\$ 91.96
Millennia LXA P100, P120, P133, P150, P166, P200	\$359.96	\$179.96	\$ 91.96
Millennia MME P166, P200, P233	\$299.96	\$139.96	\$ 69.96
Millennia MXE, LXE P166, P166 Plus, P200, P200 Plus	\$399.96	\$179.96	\$ 91.96
Millennia P100, P120, P133, P150, P166, P200 and Plus Series	\$359.96	\$179.96	\$ 91.96
Millennia Pro 200	\$359.96	\$179.96	\$ 91.96
Pro2 180, 200 (RevA & RevB)	\$291.96	\$145.96	\$ 79.96
Millennia Transport P120, P133, P150	N/A	N/A	\$ 99.96
Millennia Transport XKE P233(A), 233(B)	N/A	\$199.96	\$ 99.96
Millennia Transport XPE P133, P150, P166	N/A	\$199.96	\$ 99.96
Millennia XKU 233, 266, 300, 333	\$299.96	\$139.96	\$ 69.96
Millennia XRU 233, 233 Plus, 266, 266 Plus	\$359.96	\$179.96	\$ 91.96
Vetix EL 1000, 1000N, 2000, 2000N	\$291.96	\$145.96	\$ 79.96
Vetix LXI, LXI-N, 2LXI, 2LXI-N	\$291.96	\$159.96	\$ 85.96

IBM

	128MB Upgrades	64MB Upgrades	32MB Upgrades
Active (2137, 2136) E24, E26 and E46	\$299.96	\$139.96	\$ 69.96
Active (2140) L31, L5H, L61, L71	\$299.96	\$139.96	\$ 69.96
Active (2159), Model S7H, S64, S66, S74, S78	\$359.96	\$179.96	\$ 91.96
Active (2162) S35, S3C, S9M, S8C, S8C, S8H	N/A	\$139.96	\$ 69.96
Active (2168), Model A40, A80, A92	\$399.96	\$199.96	\$ 91.96
Active (2168), Model M82, M81, M53, M71	\$399.96	\$199.96	\$119.96
Active (2176), Model C55, C65, C86, C67, C77	\$359.96	\$179.96	\$119.96
PC 300 Series Pentium Systems (6x7x-, 6585-)	\$399.96	\$199.96	\$119.96
PC 300GL Series Pentium II Systems (6561)	\$299.96	\$139.96	\$ 69.96
PC 300GL Series Pentium Systems (6272)	\$359.96	\$179.96	\$ 91.96
PC 300XL Series Pentium Systems	\$259.96	\$139.96	\$ 69.96
PC Server 320	\$439.96	\$219.96	\$129.96
PC Server 330 PENTIUMII	\$291.96	\$145.96	\$ 79.96
ThinkPad 310ED	N/A	\$219.96	\$ 99.96
ThinkPad 365X, 365XD	N/A	N/A	\$ 99.96
ThinkPad 380, 385	N/A	N/A	\$ 99.96
ThinkPad 560	N/A	\$219.96	\$ 99.96

Industry Standard Memory

	128MB Upgrades	64MB Upgrades	32MB Upgrades
FPM 72-pin SIMM	\$299.96	\$159.96	\$ 99.96
EDO 72-pin SIMM	\$299.96	\$159.96	\$ 99.96
FPM 168-pin DIMM	N/A	\$159.96	\$115.96
EDO 168-pin DIMM	\$299.96	\$129.96	\$ 69.96
SDRAM 168-pin DIMM PC66	\$299.96	\$149.96	\$ 69.96
SDRAM 168-pin DIMM PC100	\$299.96	\$149.96	\$ 69.96

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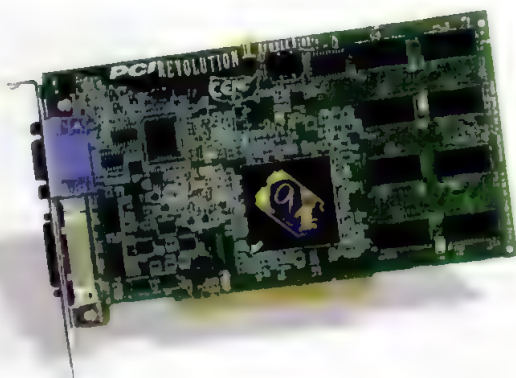
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Networking **BEST** of 1998

3Com Megahertz 56K Global Modem PC Card

A PC Card modem isn't much to look at, and it's not the type of purchase that is going to have a big impact on your capital spending plan. Nevertheless, the thin modem in your laptop is a critical link in the chain of productivity to your office and the Internet. The 3Com Megahertz 56K Global Modem PC Card (\$210 street) is ready to run with the latest V.90 code, and on our lab tests it topped the competition with fast throughput and reliable performance even on degraded lines.

3Com's Global Modem PC Card really does work around the world. The modem is certified for use in 24 countries, and the package includes special setup software for different countries.

3Com Corp., Santa Clara, CA; 800-638-3266; www.3com.com/mobile (ORS 515).



Intel Pro/100+ Server Adapter

Servers work hard, and to do their job properly, they need fast and reliable network connections. The Intel Pro/100+ Server Adapter (\$119 list) fills this bill, making it the best server network interface card we've seen to date. This card provides the throughput, scalability, and reliability needed for important servers.

Because it carries its own 82558 processor, the Pro/100+ quickly unloads the server's data bus while providing fail-over redundancy and

load balancing between multiple connections. Intel's card also sends customized reports to standard SNMP management consoles

and includes an impressive Intel utility for setup, testing, and monitoring. All of Intel's management features such as Wake on LAN are in this card. Intel provides a wide range of drivers, so you can use the Pro/100+ in any server in your

network. You can even update the processor's firmware across the LAN. Overall, the Pro/100+ is a fine investment in server performance.

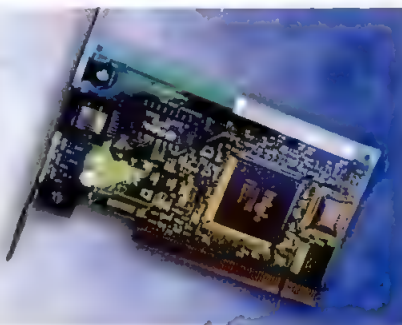
Intel Corp., Santa Clara, CA; 800-538-3373; www.intel.com/network (ORS 542).

Cisco Catalyst 2908XL, Netgear FS508

Switching is what makes the data flow. A switch gives each LAN node a conflict-free

connection. Our top choices in this critical category include a managed switch from Cisco and an unmanaged switch from Netgear. The Cisco Catalyst 2908XL (\$1,795 list) is a good backbone switch and an excellent work-group switch. The Netgear FS508 offers many similar features but without the benefits and cost of detailed management.

Cisco has packed the 2908XL with features. Cisco's Fast Ether-Channel port aggregation lets you combine two to four ports into a single logical port. This means that you can create connections with speeds up to 400 Mbps at half

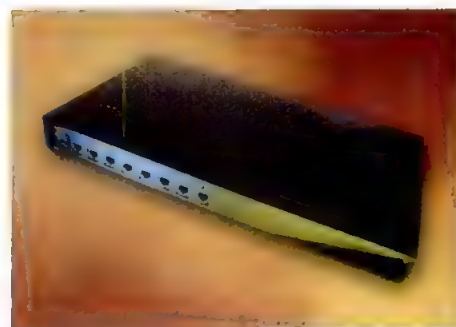


Intel Express 10/100 Stackable Hub

A stackable network hub system offers flexibility and scalability by allowing you to add modules with different functions and connection options to your LAN. The Intel Express 10/100 Stackable Hub system tops our

list for quality features. A particularly excellent choice for integrating 100-Mbps Fast Ethernet connections into your network, you can intermix up to eight of the 12- (\$1,099 list) and 24-port (\$1,499 list) 10/100 devices in one stack. Each hub device can operate at

either 10 or 100 Mbps, and a button on the front of each module toggles between the two speeds. This flexibility lets you set some devices to feed 100 Mbps to servers while others use 10 Mbps for printers. Optional modules add uplink and management features. Intel offers an excellent proprietary management program and standardized management through any SNMP console. • **Intel Corp.**, Santa Clara, CA; 800-538-3373; www.intel.com/network (ORS 542).



duplex or 800 Mbps at full duplex. Cisco's excellent management features include SNMP, RMON, and a browser interface. If you're an expert, you can use Cisco's proprietary management interface, but many people will opt for the browser-based controls.

The Netgear FS508 (\$730 street) provides high performance. If you're buying a switch to cut congestion—for example, in a network moving big print jobs or large file transfers—it's the top choice. It offers simplicity and performance.

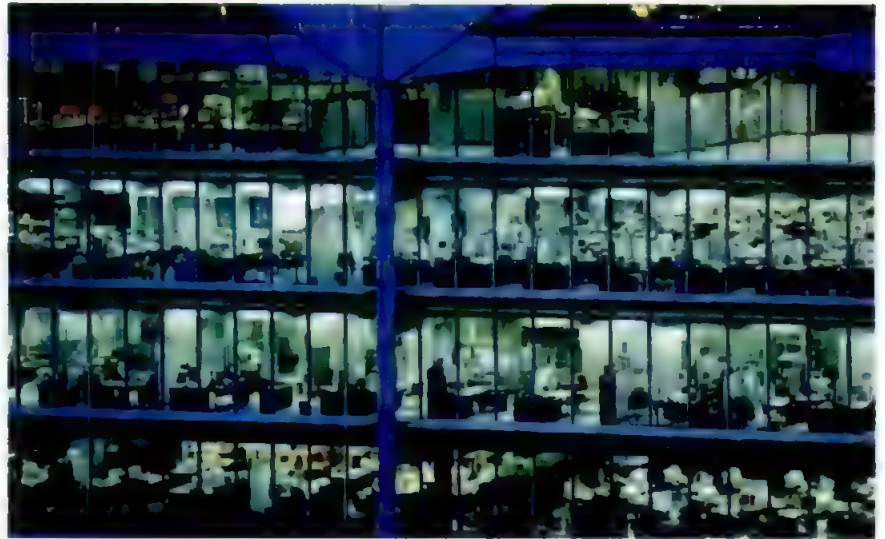
Cisco Systems, San Jose, CA; 800-533-6387; www.cisco.com (ORS 543).

Netgear Inc., San Jose, CA; 888-638-4327; netgear.baynetworks.com (ORS 544).

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Applied Systems is an international software developer dedicated to providing cutting-edge automation solutions for the independent insurance vertical market.



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Netgear Network Starter Kit SB104
Networks aren't just for experts. Many people want an easy way to connect their PCs without becoming a systems integrator. A net-



work starter kit bundles network interface cards, cables, and a hub along with detailed instructions to give novices the confidence to build their own network.

The Netgear Network Starter Kit SB104 (\$100 street) delivers the best mix of qualities we've seen. Some starter network kits offer only a proprietary dead end with few options for growth, but Netgear's hardware combination offers a built-in upgrade path while sidestepping compatibility worries. The package includes two 10/100 PCI NICs and a four-port, 10-Mbps hub. You also get easy-to-understand illustrated documentation, and the kit is backed by unmatched technical support. At only \$45 per PC, the Netgear Starter Kit SB104 is an excellent value.

Netgear Inc., San Jose, CA; 888-638-4327; netgear.baynetworks.com (ORS 544).

WinProxy

Many people need a proxy server and don't realize it. A proxy server maximizes Internet connections, protects the privacy of the users on the LAN, and acts as a firewall guarding against intrusion. Some proxy servers come as turnkey boxes, while others are software.

Our vote for the best workgroup proxy server goes to WinProxy (\$299 list), from Osis Software.

This software product retrieves and stores Web pages, and in addition it forwards numerous Internet services such as POP3, RealNetworks' RealAudio, and

America Online, making access to the Internet transparent. Security features let you prevent or restrict Internet access based on an IP address. Logging features let you monitor access. You need some knowledge of IP addressing to set up and manage WinProxy, but the

system is helpful and forgiving.

Osis Software, Pleasanton, CA; 888-946-7769; www.osis.com (ORS 545).

Seagate Backup Exec for Windows NT

There's almost nothing as bad as the feeling you get when you realize that your files are gone for good. Seagate Backup Exec for Windows NT, Version 7.2 (\$695 list for a single server; \$1,395 for multiple servers), almost guarantees long-term happiness. By the time you read this, Backup Exec will likely be owned by Veritas Software Corp., which is planning a merger with Seagate Software's Network and Storage Management Group. The package includes a feature called Working Set Backup, which reduces downtime by backing up only those files that are used in a normal workday. You also get virus protection and centralized monitoring and reporting. Most important, Backup Exec is a time-tested solution. We think it's the best place to back up your data.

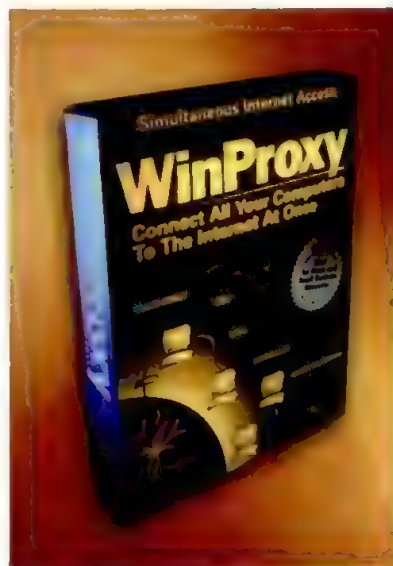
Seagate Software Inc., Heathrow, FL; 800-327-2232; www.seagate.com (ORS 546).

Intel NetportExpress 10/100 Print Server

Sharing one or more printers is still the primary reason for establishing a LAN, but it's often inconvenient to attach shared printers to PCs. A stand-alone print server is an alternative way to link a printer to a LAN. The Intel NetportExpress 10/100 Print Server (\$330 street) works with virtually any protocol, such as IPX, TCP/IP, AppleTalk, and NetBEUI, and you can use it to share printers on NetWare, Microsoft Windows, and Unix-based networks.

The NetportExpress unit offers excellent performance and great management capabilities. Printing is expensive, and this print server allows you to gather all kinds of statistics on the use of your printers—information valuable for budgeting and management control. You can also use the browser-based and Windows-based management programs to configure the different options, reset the server, and monitor print jobs. If your printer is bidirectional, you can even see if it is off-line, is out of paper, or has a paper jam.

Printing should be taken for granted. The NetportExpress helps to make printing that easy. **Intel Corp.**, Santa Clara, CA; 800-538-3373; www.intel.com/network (ORS 542).



MY FAVORITES OF '98

You would need a big truck to cart off all of the best networking products of 1998. This category continues to grow as networking becomes a part of everything we do. The best network products follow the "-ilities": They provide scalability, flexibility, affordability, and reliability.

Products such as the Shiva AccessPort snap onto the LAN and share a fast 128-Kbps ISDN connection. And it takes only a few clicks to set them up. Networking is easier because products like the Netgear Network Starter Kit bundle everything you need into one box.

Providing high quality and flexibility at a reasonable price spurs growth, as Intel has proved with

the Express 220T Stackable Hub and the NetportExpress 10/100 print server.

An Internet connection is a sophisticated piece of technology and could be daunting, but smart companies have hidden the Internet's complexity and painted it over with simplicity. The WinProxy server, from Osis Software, runs on a PC and makes sophisticated decisions on how to use an Internet communications line while keeping out intruders—seemingly without human intervention. The SonicWall Plus, from Sonic Systems, is a turnkey security firewall in an affordable and easy-to-manage box. Power in a velvet glove reaches its ultimate form in the Cobalt Qube, a standalone Web server appliance.

But many companies look for more than low cost and simplicity. Enterprise networks need scalability and value. RAID products such as the Artecon RAIDPro XL deliver these qualities.

"The best networking products provide scalability, flexibility, affordability, and reliability."

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WEB STOREFRONT Software

By Jay Munro and David Lidsky

When you hang out your online shingle, the solution you choose must give you room to grow. We review seven tools that give you power and extensibility in building your e-commerce store.

Maybe you've heard it called the Internet Economy. Or the New Economy. What these highfalutin terms boil down to is either expanding your preexisting real-world business onto the Web the same way you moved into the Cleveland market, or starting from scratch and going international from day one on the Web.

Whether you're like Disney, seeing the Web as one big Disney Store, or more like startup Sparks.com, looking to sell greeting cards online, the way you go about getting your business onto the Web can vary widely. Inexpensive Web-based solutions such as MerchandiZer or Yahoo! Store ("Sell It on the Web," November 17, 1998) can get you up and running quickly with something modest, but your business may outgrow it. High-end turnkey offerings, such as those offered by Pandesic and Netscape, can run well into six

figures, but they'll automate many of your back-end processes (see the sidebar "High-End E-Commerce Options").

The seven products we review here represent a happy medium—of sorts—between the two extremes: They overlap both ends of the scale, being affordable (between \$3,500 and \$8,000), and yet powerful and extensible enough to build the

most sophisticated Web store imaginable. For example, Dell Online, one of the most successful e-commerce offerings today, runs on a highly customized version of Microsoft Site Server, reviewed here. Any questions?

Choosing from among these products, whether they'll be hosted internally in your company or through a full-service ISP, isn't easy. You're often forced to choose between power and ease of use, and the systems you presently run can be a deciding factor as well.

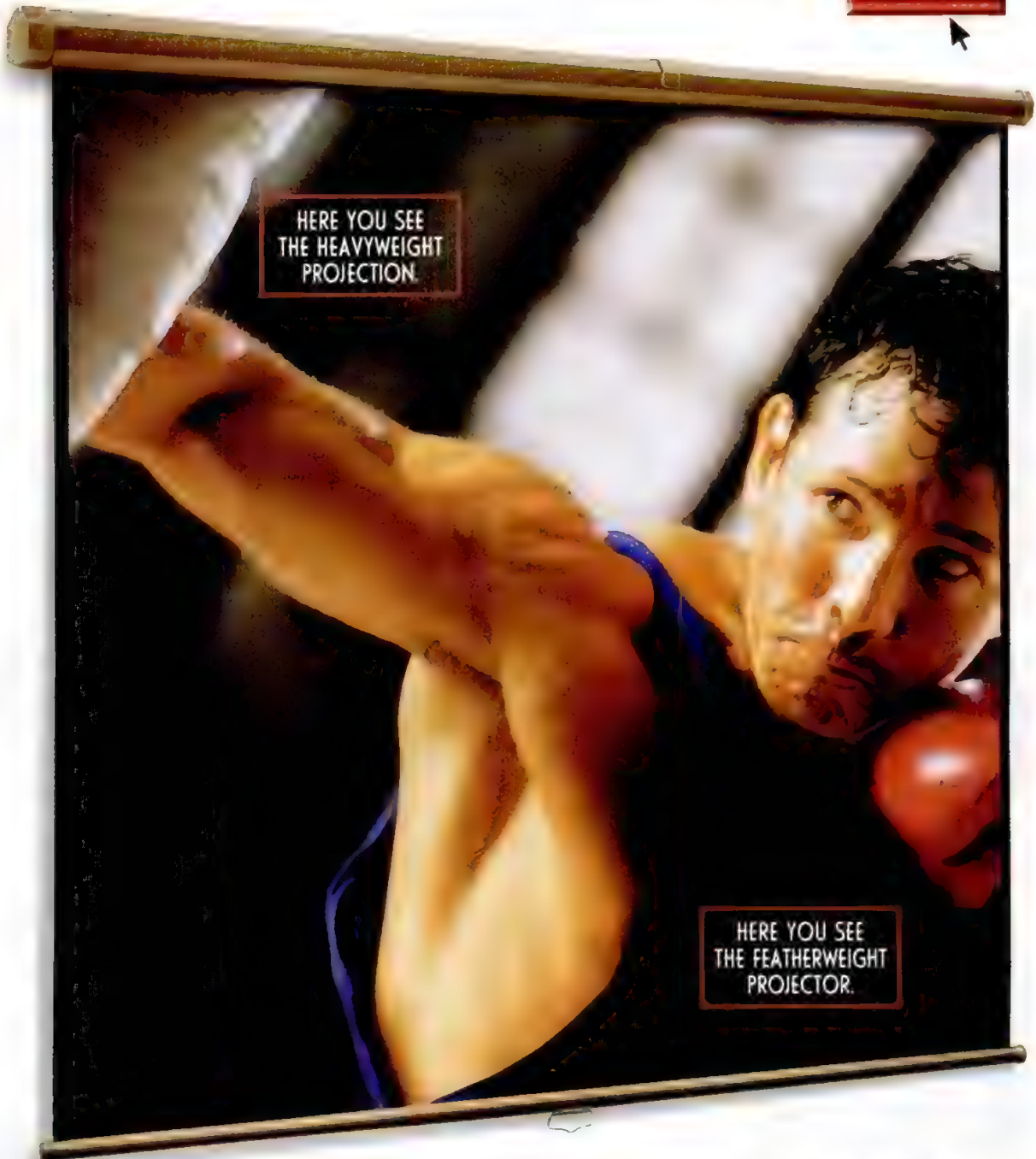
The difference between these solutions and

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Cart2Go 2.0	10
CityBase Commerce Suite 2.0	10
Commerce Engine	10
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the low-end ones is that here, you have full control not just over content, but also over architecture, management, and merchandising. Almost all of these products let you build a basic store without having to use any programming. But you won't be getting your money's worth if you use only their prebuilt functionality.

IN-HOUSE TALENT

The key factor may ultimately be the type and caliber of programming talent you either have on hand within your organization or can easily recruit. Both iCat and Intershop require you to learn a proprietary language to extend the products beyond the functionality provided by wizards and templates. AbleCommerce is based on Allaire's Cold Fusion, and Microsoft Site Server is based on Active Server Pages (ASP). The latter two are more popular development options, but you'll still need the right people to implement them.

Integration with legacy systems is another consideration. Most products here have hopelessly inadequate data-import facilities. Simple importing from a flat, comma-delimited file or a spreadsheet proved to be daunting for all but AbleCommerce and Intershop. Hooking into existing accounting systems, the ideal scenario for truly putting your existing business online, is effective with Microsoft Site Server if

you're using Microsoft BackOffice systems, or IBM Net.Commerce with SAP system support (using IBM's higher-end version).

In defense of most of the vendors, however, legacy systems are usually databases and can be integrated by using the scripting or language capabilities the products offer. But again, that means that your buying decision is colored by the level of programming or Web expertise you have on hand or need to hire.

Yet another item to consider is your ability to link to inventory and fulfillment systems. Net.Commerce, for example, offers built-in inventory control that will let you set inventory levels and sync with an actual business if needed.

Your own product is also a factor in the decision. Maestro, for example, can specify multiple inventory locations for time-sensitive products such as flowers or other perishables for drop shipping. Net.Commerce competently supports selling downloadable products, such as documents, music, or software.

The purpose of your Web site is to drive business, whether by direct online selling or by steering traffic to real-world stores. The tools we review here offer you the best platforms for growing your business online—that is, scaling it up from something modest, then delivering more and more options and services as time goes by.

REVIEWS

AbleCommerce Developer 2.6

\$3,495 list. Able Solutions Corp., Vancouver, WA; 360-687-6064; www.ablecommerce.com; 500 at www.pcmag.com/info/ink.

● If you're a Cold Fusion developer or are interested in becoming one, then Able Solutions' AbleCommerce Developer 2.6 is a good candidate for building your Web storefront. Not only is it built around and bundled with Allaire's Web development environment Cold Fusion, it's so integrated with Cold Fusion that determining where Cold Fusion stops and AbleCommerce begins is almost impossible. Though Cold Fusion is popular, most

developers lean toward more sophisticated Internet transaction environments such as NetDynamics or WebLogic. Another problem with AbleCommerce is that it lacks a visual interface development environment such as the one you'll find in Microsoft Site Server.

In AbleCommerce, you'll find wizards that let you quickly build and customize storefronts. Though only four customizable Cold Fusion templates come in the box, you can choose from more than 400 on the Web site, so few companies will have to build stores from scratch. Using the wizards, you can selectively turn on or off headers, footers, navigation, guest

Our Contributors: DAVID S. LINTHICUM is a contributing editor of *PC Magazine*. RICHARD V. DRAGAN is a programmer at PC Magazine Labs. GARY GUNNERSON is an IT architect at Gannett Co. Inc. JAY MUNRO was the project leader, and DAVID LIDSKY was the associate editor in charge of this story.

Editors' Choice

Net.Commerce Start 3.11



Which Web storefront package is right for you

depends largely on your existing platform and in-house expertise. We award our Editors' Choice to IBM's Net.Commerce Start 3.11 for delivering a very sophisticated and powerful solution and giving you the greatest flexibility no matter what decisions you've already made. Net.Commerce lets you start building your store with its wizard, then showcases its thoughtful product design in a forms-based structure that lets you extend your store without coding. After that, you will need to use code to make custom alterations. But rather than locking you into platform-specific or proprietary languages, Net.Commerce lets you build onto your e-commerce site using C++, Java, or JavaScript.

Both Cat@log 2.5 and Microsoft Site Server 3.0 Commerce Edition deserve an honorable mention. If you've got a significant investment in the Microsoft Windows NT platform, Site Server represents a natural extension into e-commerce. You can perform your Web development using Visual InterDev, tie into your data with SQL Server, and host your ASP-driven site on Microsoft Internet Information Server (IIS).

If your expertise is in database development, check out Cat@log, which lets you take advantage of the way you've structured your database and leverage it for customized Web storefront development. The approach is methodical because each site element needs supporting data fields in your database, but it ultimately gives you flexibility.



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book features, and auto-centering. Each store can have its own set of customizable wizard templates.

Database support is average, with support for local Microsoft Access 7.0 right out of the box, and with the ability to

ucts are further categorized by group names, and a product can have up to two pages of additional detail. All of this information exists in the database and is dynamically read from there. The database setup feature is a function of Cold Fusion.

In order to adjust for different types of browsers, the database tracking system stores each user's browser information, including the browser's ability to support a secure connection (such as support for SSL or S-HTTP). If the browser supports a secure connection, AbleCommerce automatically turns on encryption during checkout. After an order is placed, the store owner

Administration of our test commerce site front end was easy through a Web browser. For example, the Styles feature lets you personalize your Web pages with custom navigation bars, logos, arrows, and so on. You can also set up custom backgrounds and page colors for the site.

We found that the reporting system leaves a lot to be desired, with site performance reports gathered through WebTrends, a bundled Web server reporting system. A few sales reports are also included, such as Sales by Date, Sales by Browser Type, and generic customer statistics. If you need more than that, you'll have to purchase a more powerful third-party reporting tool, such as ReportSmith or Crystal Reports, and go directly to the database.

You may want to extend the features of AbleCommerce by simply downloading \$25 add-ons and plug-ins, such as ADable, a banner-advertisement management system, from the AbleCommerce site. Moreover, AbleCommerce provides full API support for Microsoft, Netscape, and O'Reilly.—David S. Linthicum

Cat@log 2.5

\$7,950 list. Catalog International, Scotts Valley, CA; 831-461-2100, 888-488-3228; www.catalogint.com; 501 at www.pcmag.com/infolink.

● Every other product in this roundup lets you design an e-commerce site from scratch using templates and other user-friendly tools, but Catalog International's Cat@log 2.5 takes a different

1. In AbleCommerce, you can add, edit, and delete stores and store groups (also called malls) from the Store Group menu list. 2. You can see a list of all pages used by your store by selecting Web Pages from the Merchant menu.

migrate to Microsoft SQL Server when the load increases—using Microsoft's Upsizing Wizard. With Cold Fusion's ODBC support, AbleCommerce should be able to reach most relational databases, even those locked inside of mainframes. AbleCommerce, however, is not aimed at those databases, focusing instead on the Windows NT market.

The AbleCommerce inventory structure begins with a top category level that expands down to other levels. The prod-

uct can be notified automatically by e-mail or fax (fax software is bundled with the product).

When applying discounts during our test, we found that we could do it by product, group, or category level using AbleCommerce's order-processing setup feature. You may base discounts on the dollar amounts of purchases (for example, taking \$100 off for purchases over \$1,000) or percentages (such as taking 20 percent off for tropical fish purchases this week).

Suitability to Task

	AbleCommerce Developer 2.6	Cat@log 2.5	iCat Electronic Commerce Suite 3.0 Professional Edition	Intershop 3 Merchant Edition	Maestro Commerce Suite Professional Edition 3.0	Microsoft Site Server 3.0 Commerce Edition	Net.Commerce Start 3.11
POWER							
Installation and administration	Good	Good	Excellent	Excellent	Good	Excellent	Excellent
Store design	Fair	Excellent	Good	Good	Fair	Excellent	Excellent
Order processing	Fair	Good	Good	Good	Good	Excellent	Good
Reporting	Fair	N/A	Fair	Excellent	Good	Excellent	Fair
Mainframe legacy integration	Fair	Fair	Fair	Fair	Fair	Good	Excellent
Order flexibility	Good	Good	Fair	Good	Fair	Good	Excellent
Database support	Fair	Excellent	Good	Good	Fair	Good	Good
EASE							
Installation and administration	Good	Fair	Excellent	Excellent	Excellent	Excellent	Good
Store design	Fair	Fair	Good	Good	Excellent	Good	Fair
Order processing	Fair	Fair	Good	Good	Excellent	Excellent	Good
Reporting	Fair	N/A	Good	Excellent	Excellent	Excellent	Fair
Mainframe legacy integration	Good	Good	Good	Good	Good	Good	Good
Order flexibility	Fair	Good	Good	Good	Good	Good	Good
Database support	Fair	Good	Good	Good	Excellent	Good	Good

N/A—Not applicable. The product does not have this feature.

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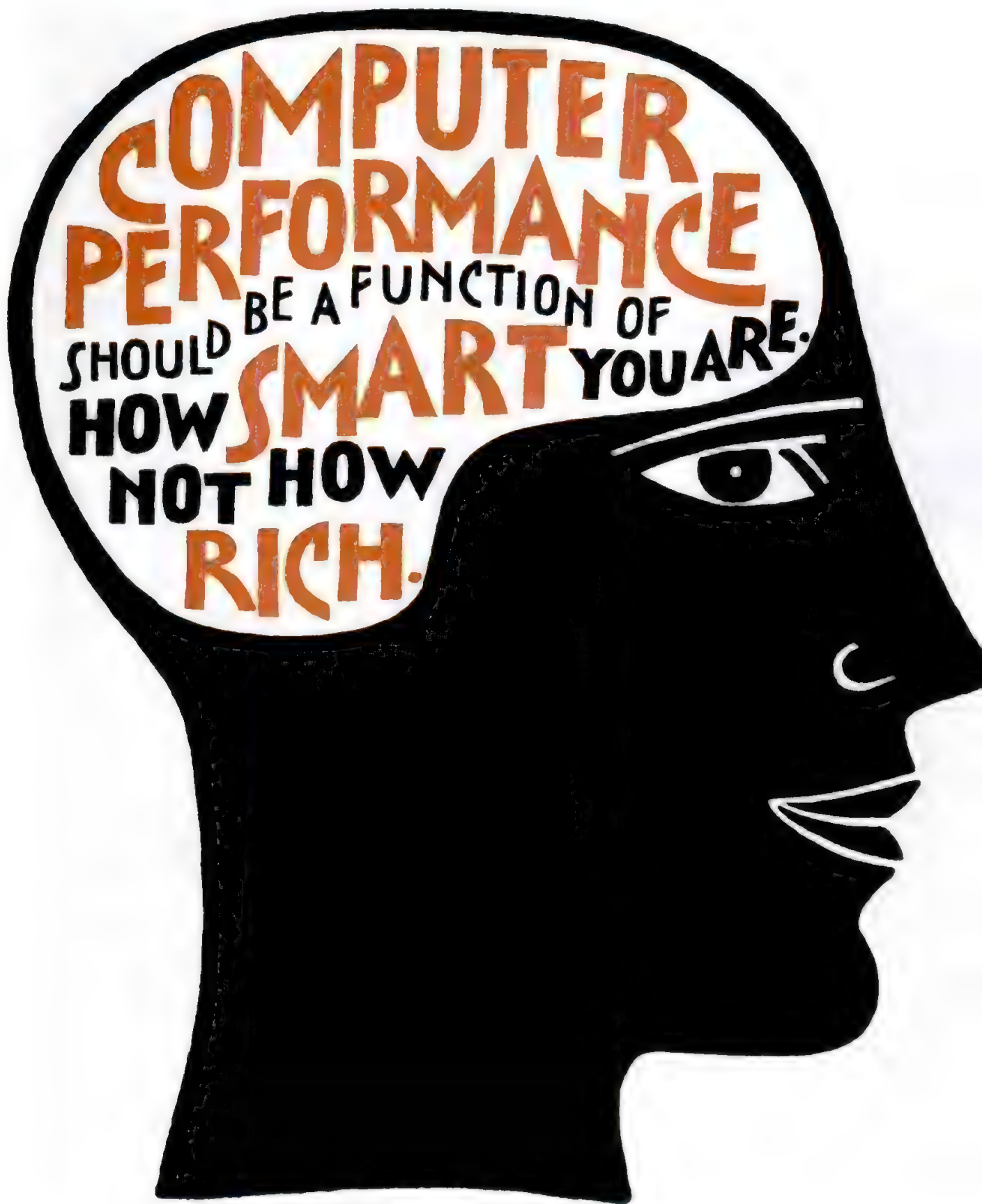
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approach. Cat@log is for building a site that is highly integrated with your existing databases, and no other package here is better suited. Along with this power comes complexity, though, because every new feature you add to your site—such as specials—needs supporting data fields within your database. The other products either would have prebuilt features or would require programming.

5 TO GROW ON

You can use any of the tools in this roundup to build your Web storefront, but that doesn't mean that your e-commerce site is open for business. Here are the five steps that will really get you up and running on the Web.—Mark Childers

Step 1.

WEB SERVER

You'll host your Web storefront on a Web server. This consists of the software that will serve your application to site visitors and the hardware that will host your server and application. The average hardware should have 128MB of RAM and anywhere from 150MB to 1GB of free hard disk space. Server software options vary depending on which storefront application you've used, but Microsoft Internet Information Server, Netscape Enterprise Server, and the freeware Apache are all good solutions.



But developers familiar with database design, HTML, and property boxes will feel right at home using Cat@log commerce objects and controls to select and display commerce pages in completely customizable HTML formats.

Rather than importing catalog data into its own database, Cat@log easily maps directly to your data stores across multiple platforms, a feature we didn't find in any of the other products in the roundup. Cat@log components depend entirely on the underlying databases they access. Consequently, bad database designs yield poor results, while good designs provide unlimited potential. A rapid prototyping session, in which you put together a store's framework and then go back and fill in the blanks, is one good

way to develop a commerce Web site with Cat@log. But a detailed analysis and design with data flow tools, such as Platinum Technology's ERwin, is the best design method.

Cat@log's best feature is its ability to dip into existing databases using native Informix, Microsoft SQL Server, Oracle, and Sybase calls while supporting ODBC calls to other databases. None of the other products in this roundup have this feature, which lets programmers update existing systems without programming export, import, and update routines. If your enterprise solution requires this level of integration, Cat@log may be your best electronic-commerce choice.

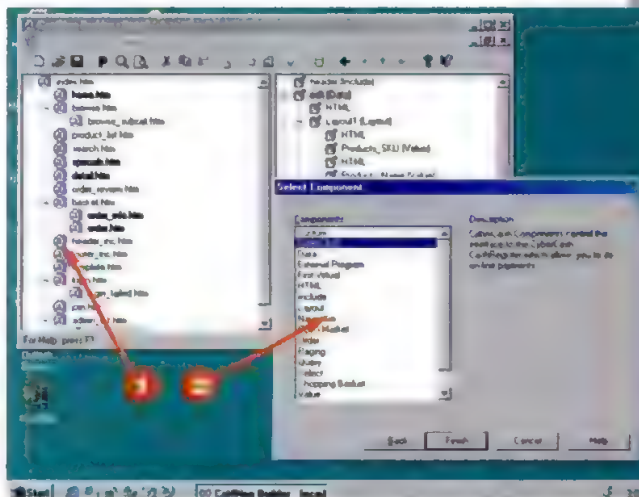
Because Cat@log doesn't include its own HTML tools, you choose your preferred third-party tools during installation and hook them into the product. You then start your project by selecting one of Cat@log's examples or starting from scratch. Most developers will choose the latter option.

Cat@log's main screen, called Builder, offers a Windows Explorer-like interface to your project pages with a hierarchical view of page components. In the first steps, you create common, shared HTML pieces such as headers, footers, and common layout components. These design components are then used in subsequent page development through the Include component.

When you're creating displays of database rows, the default selections provide only a table with one row per record or space-delimited columns. Missing is a single-record form for individual-record selection when editing or adding new records to a database. One situation in which this is obvious is when you're adding and updating a user's shopping information, such as name and address.

And once a page is created, changing individual attributes for each column of a query result requires selecting and changing each field individually. A multiselect option would be more desirable.

As with many of the other products tested, Cat@log's shopping basket component uses client-side cookies to maintain the list of items in the cart. If you need more flexible order completion, however, you'll need to develop an expanded state mechanism. Within Cat@log, you'll need to program a procedure for the new shopping basket logic



1. The familiar hierarchical view makes navigation and drag-and-drop, right-click editing easy. 2. Cat@log's Builder lets you choose one of several component wizards to add capability to pages on your site.

and then connect it by using an external object call within the design tool.

Cat@log's Navigator component keeps track of sitewide menu items, assuring a uniform user interface. Taxes, shipping, and volume discount components depend entirely on your external database structures for each, although TaxWare integration is supported. Payment options for CyberCash, First Virtual, Open Market, and Verifone all receive their own property sheets and sections in the manual to ease their connections to Cat@log.

In the development phase, a useful feature we found is the ability to develop with a test database (such as Access) and then publish to a production database (such as Sybase SQL Server) on another computer. Development can thus proceed without affecting the live system. Unfortunately, the design tool is single-user, so you can't use it with larger projects where a collaborative mechanism is necessary.

The server portions of Cat@log include a runtime publisher component, commerce modules, and site statistics routines. The runtime component defaults to



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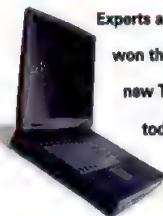
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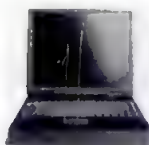
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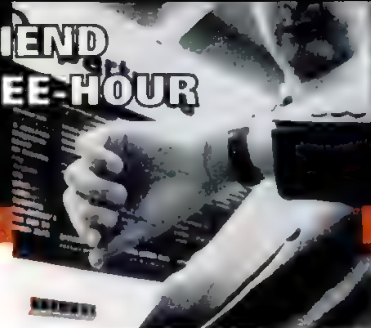
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You don't get to recharge your batteries every four hours. You don't get to rest whenever you feel like it. Why should your notebook? Life on the road is no cake walk and your notebook should be designed to endure the rigors of mobile life as well as you do. Introducing the GoBook notebook. With a revolutionary modular battery design, lightning-fast performance featuring the fastest Intel Pentium II processors, and an incredibly thin and light package, it's the ultimate companion for those who stop at nothing to succeed. And with its new, innovative Wedge Battery, the GoBook offers even more flexibility for extended battery life, even when the media bay is in use. In addition to longer life and lower weight, the new Wedge battery is also designed to provide a 9° ergonomic tilt to the keyboard and entire machine allowing for more comfortable use. It's no wonder that CNET awarded the GoBook Editors' Choice for best UltraPortable on the market, saying, "For standing up to the vagaries of travel, the Micron GoBook is the best bet going."

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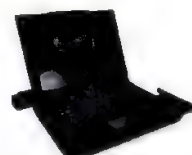
"The GoBook outperformed every other machine in our review by a sizable margin" CNET, Editors' Choice, Best UltraPortable Reviewed, May '98



Here's the GoBook difference: Featuring the fastest Intel Pentium and Pentium II processors
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Micron's Award-Winning GoBook Now Starts at Just \$1,799



GoBook™ 233



GoBook² 266



**New!
GoBook² 300**

Model Name	GoBook™ 233	GoBook² 266	New! GoBook² 300
Processor	Intel® Pentium® processor with MMX™ technology 233MHz	Intel Pentium II processor 266MHz	Intel Pentium II processor 300MHz
Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	64MB EDO DRAM	32MB EDO DRAM	32MB EDO DRAM
Hard Drive	3.2GB hard drive*	3.2GB hard drive*	3.2GB hard drive*
Monitor	12.1" SVGA TFT display	12.1" SVGA TFT display	12.1" SVGA TFT display
CD-ROM	24X CD-ROM drive	24X CD-ROM drive	24X modular CD-ROM drive
Graphics	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator
Sound System	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
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Software Included	Microsoft® Windows® 98 System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 System Wizard Mobile Client™ Norton AntiVirus	Microsoft Windows 98 System Wizard Mobile Client™ Norton AntiVirus
Also Includes:	GoBook Wedge battery 5.2lbs (w/wedge battery & floppy drive) 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for \$299	GoBook Wedge battery 5.2lbs (w/wedge battery & floppy drive) 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for \$299	GoBook Wedge battery 5.2lbs (w/wedge battery & floppy drive) 6.7lbs (w/opt./base battery & floppy) USB, parallel, serial, VGA, PS/2, NTSC/S-Video ports MPEG compatible CardBus/Zoomed Video ready Microphone, stereo line-in/out jacks 2 Type II/1 Type III PCMCIA slots 2-way infrared port Touchpad pointing device 3.5" modular floppy drive • Add SuperBase Battery for \$299

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Cache	128KB Intel® L2 cache	128KB Intel® L2 cache	128KB Intel® L2 cache	512KB Intel® L2 cache	512KB Intel® L2 cache
RAM	32MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
Hard Drive	3.4GB Ultra ATA hard drive*	3.4GB Ultra ATA hard drive*	3.4GB Ultra ATA hard drive*	3.4GB Ultra ATA hard drive*	16GB 7200RPM Ultra ATA hard drive*
Monitor	15" Micron 7000x monitor (15.9" display)	17" Micron 7000x monitor (15.9" display)	17" Micron 7000x monitor (15.9" display)	19" Micron 9000x monitor (18" display)	19" Micron 9000x monitor (18" display)
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Modem	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**
Graphics	onboard Neo 128, 4MB SGRAM 3D AGP graphics	onboard Neo 128, 4MB SGRAM 3D AGP graphics	onboard Neo 128, 4MB SGRAM 3D AGP graphics	16MB Diamond Viper 550 VTX 2X AGP graphics	16MB Diamond Viper 550 VTX 2X AGP graphics
Sound System	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 128-voice WaveTable sound	PCI 128-voice WaveTable sound
Warranty	3-year/3-year Micron Power Limited warranty	3-year/3-year Micron Power Limited warranty	3-year/3-year Micron Power Limited warranty	3-year/3-year Micron Power Limited warranty	3-year/3-year Micron Power Limited warranty
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CGI support for compatibility across all Web servers, but it also supports ISAPI for Microsoft and NSAPI for Netscape to increase server performance. A helpful feature of the statistics module is support for click-stream analysis, which tracks how a buyer traverses your commerce site so you can improve navigation or offer sale items where most appropriate. Any field in any database can also be counted

iCat Electronic Commerce Suite 3.0 Professional Edition

\$9,995 list. iCat Corp., Seattle; 888-289-4226; www.icatcorp.com; 502 at www.pcmag.com/infolink.

● As with most products in this roundup, iCat Electronic Commerce Suite 3.0 Professional Edition lets you create a basic online store quickly by using its impressive array of templates and wizards. But to customize a site further and get value for your money, you need to use iCat's proprietary command language, Carbo. iCat offers a good mix of built-in functionality and extensibility for the more ambitious e-commerce Web site, along with cross-platform deployment support.

The iCat wizard tool can build you a working store within minutes. The package's choice of 20 templates provides more flexibility than several other products reviewed here, such as IBM's Net.Commerce Start. Basically, the wizard tool let us pick from a number of backgrounds and button styles.

The default store has a shopping basket; a variety of payment and shipping options including CyberCash, IBM, and Verifone for payment-processing; and FedEx and UPS for shipping. The store we made with the wizard could have gone online immediately without any further customization, unlike Microsoft Site Server's wizard-created store, for example, which required further customization.

For the smallest stores, carrying a dozen or so items, you could use a default store unchanged. But if all you want to create is a small-scale store, you can get away with spending a whole lot less money than you'll spend for iCat.

A more ambitious site requires programming, and in iCat's case, that means using its proprietary language, Carbo. Although the language—which is similar in syntax to the SQL database-manipulation language—makes the product extensible, you will need to develop some specialized programming know-how to use it.

During our tests, customizing a sample store with Carbo was not as difficult as customizing with the platform products—from IBM and Microsoft—which use more common languages. But don't attempt to take on a Carbo project without a background in Web design and some programming experience with Visual Basic or its equivalent.

The printed documentation for the Carbo API is straightforward, and there is additional online support available on the iCat site, as well as fee-based training and technical support. Carbo Editor is a capable tool for modifying scripts, but it does not feature visual design. Though similar to Microsoft's Visual InterDev, Carbo Editor is less powerful, because it is limited to Carbo scripts only.

The handy Data Entry Manager let us import and edit database tables fairly easily, though importing data was somewhat tricky, because of the need for tags between data fields. But this tool is still better than what you get with Microsoft Site Server and Net.Commerce for data importing.

Step 2. PAYMENT SERVICES



Merchant Account

In order to accept credit cards, you must open an Internet merchant account with a bank.

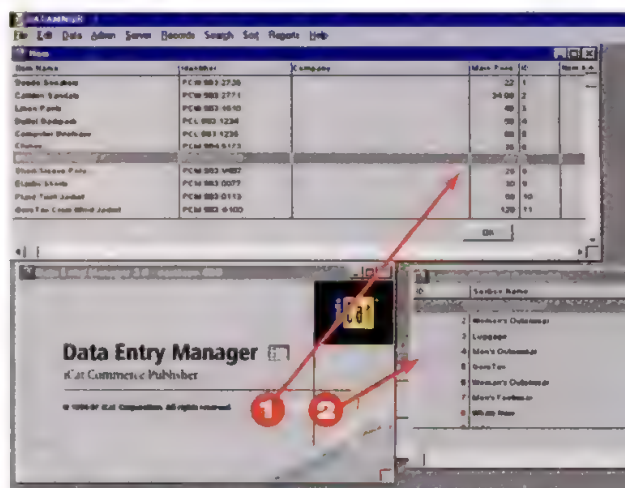
Payment Processing

1. You can't communicate directly with your bank, so you need to submit secure credit card transactions to a transaction-processing service such as PaymentNet or CyberCash. 2. These services will, in turn, send transactions to a payment-processing network like FirstData with your merchant account information for authorization. 3. Once the product ships, 4. the transaction is submitted for settlement and the payment-processing network changes the customer's credit card and submits payment to your bank account.



for sophisticated statistical reporting.

You may need expertise and time to create a Cat@log solution, but that solution will be highly configurable and tie in with your current infrastructure better than any other solution we tested.—Gary Gunnerson



1. The powerful iCat Data Entry Manager (part of its Commerce Publisher tool) lets you manage all the contents of your store. 2. Adding new products is as simple as adding new records to the database—no developer effort required.

To develop a Web site in iCat you go to a separate staging area, in this case using Sybase SQL Anywhere 5.5 for your database. When deployed to a production server, the target database can run on Windows NT, and the site can be served from either Microsoft IIS or Netscape, on Windows NT or on one of several Unix platforms (including HP-UX, Irix, and Solaris). On the plus side, Carbo scripts, like CGI scripts, are platform-indepen-

1. Start image editing software
2. Choose "file acquire"
3. Pre-scan page
4. Set scan area
5. Set resolution
6. Set scan mode
7. Scan page
8. Close TWAIN
9. Save file
10. Close image editing application
11. Start e-mail package
12. Start new message
13. Choose "attach file"
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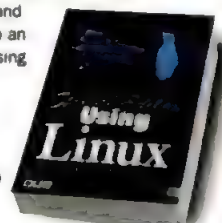
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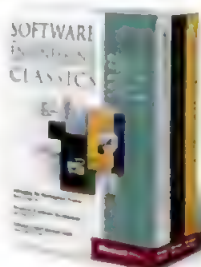
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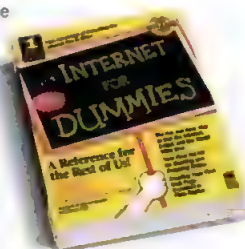
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THE LITTLE iMAC BOOK

by Robin Williams

Master your iMac with this indispensable, easy-to-understand guide that explains everything you'll need to know, from the basics of starting up and shutting down to the various applications that come with the machine. Award-winning author Robin Williams' friendly tone and simple explanations will keep you on track. (Peachpit Press)

Pub. Price: \$17.99

Discount 20%

B&N Price: \$14.39



WEB PAGES THAT SUCK

by Vincent Flanders
and Michael Willis

This unique, funny and informative book critiques bad Web sites and then applies practical, hands-on common sense to create site make overs. Written by the creators of the popular, award-winning site, "Web Pages That Suck," this down-to-earth guide is as entertaining as it is insightful, and will be useful to Web designers at all levels. (Sybex)

Pub. Price: \$39.00

Discount 20%

B&N Price: \$31.20



TEACH YOURSELF HTML 4 IN 24 HOURS, THIRD EDITION

by Dick Oliver

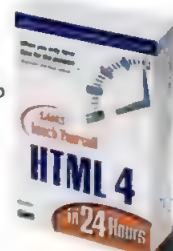
Here is the quickest way for beginners to learn everything they need to know to create their own Web pages in HTML 4. This updated edition covers the latest HTML and Web publishing developments and the new generation of browsers from Microsoft and Netscape.

The logical, step-by-step order and novice-oriented approach of this guide makes it an invaluable resource for first-time Web page authors. (Sams)

Pub. Price: \$19.99

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B&N Price: \$15.99



PROGRAMMING WINDOWS®, FIFTH EDITION

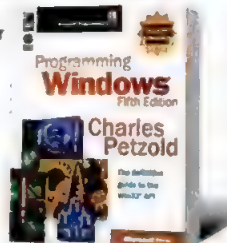
by Charles Petzold

When serious developers have a question about Windows programming, the final word is always "Look it up in Petzold," the most authoritative, example-packed, and thorough reference and tutorial for Windows programmers. This edition has been fully revised for Windows 98 and includes new coverage of the Internet, Unicode, expanded multimedia coverage, and a chapter on inter-process communication. (Microsoft Press)

Pub. Price: \$59.99

Discount 20%

B&N Price: \$47.99



ACCESS® 97 DEVELOPER'S HANDBOOK™, THIRD EDITION

by Paul Litwin, Ken Getz
and Mike Gilbert

Develop high-performance, intuitive, Internet-ready Access 97 applications using the completely updated and revised third edition of this bestselling handbook. Written by internationally recognized Access experts, this authoritative resource shows you how to optimize tables, queries and reports, learn to write your own wizards, create user-friendly applications for multi-user environments, and much more. (Sybex)

Pub. Price: \$59.99

Discount 20%

B&N Price: \$47.99



TEACH YOURSELF VISUAL BASIC® 6 IN 24 HOURS

by Greg Perry with Sanjaya Hettihewa

This straightforward guide gives a quick, concise introduction to the Visual Basic programming language. Following the practical, step-by-step approach of the Sams Teach Yourself Series, the book uses task-oriented examples to teach readers the essentials of topics such as creating and using Active X controls, database programming, and Internet programming. (Sams)

Pub. Price: \$19.99

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dent, giving iCat an edge over ASP-based products such as Microsoft's Site Server, in case you're working in a heterogeneous environment.

Because iCat offers a programmatic interface, you can make it work with any existing ODBC data source to connect as its database (it includes native support for Oracle and Sybase). Hooks to accounting

istration features give you full control over product lines, promotions, and sales-information retrieval.

We found the reporting reasonable, with canned reports for sales history, but the product lagged somewhat on site-analysis features. Unlike Microsoft and Maestro's packages, for example, which bundle site-analysis tools, iCat requires you to supply your own tools to track specific information about hits on your Web pages and similar site activity.

With its range of features, extensible API, and flexible deployment options, iCat can meet the needs of many a would-be e-business.—Richard V. Dragan

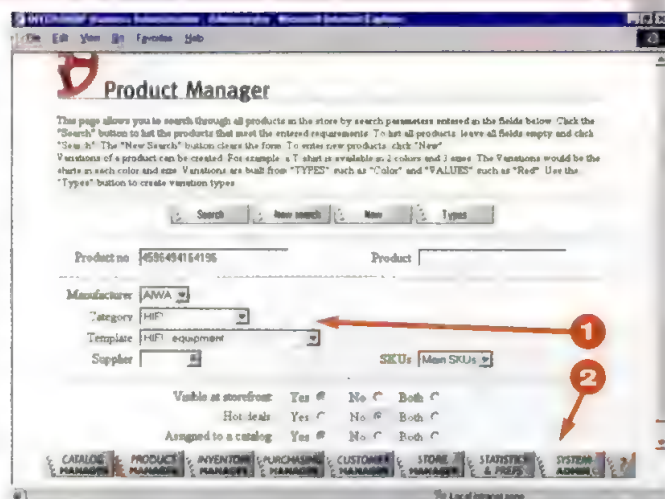
InterShop 3 Merchant Edition

\$4,995 list. InterShop Communications Inc., San Francisco; 800-736-5197; www.intershop.com; 503 at www.pcmag.com/infolink.

●InterShop 3 Merchant Edition's approach to the problem of Web storefront building is the same as iCat's: Get something functional up quickly, then customize it with a proprietary language. Even though InterShop has great features, such as its setup wizards and catalog- and data-management tools, the product's lack of visual design tools, its clunky browser-based interface, and the proprietary language you must use to enhance your storefront beyond the basics hamper it.

InterShop's proprietary language, called Template Language Extensions (TLE), is powerful and makes the product highly customizable. Though TLE is easy to learn, it's not open, and you're not going to find many TLE programmers out there. Net.Commerce and Site Server offer JavaScript or VBScript, more open and widely known languages, to extend your store's functionality. We ran into the same problem with iCat's proprietary Carbo language.

If you overlook the TLE issue, InterShop is a viable e-commerce solution. One of its biggest improvements over previous versions of InterShop is the new Store



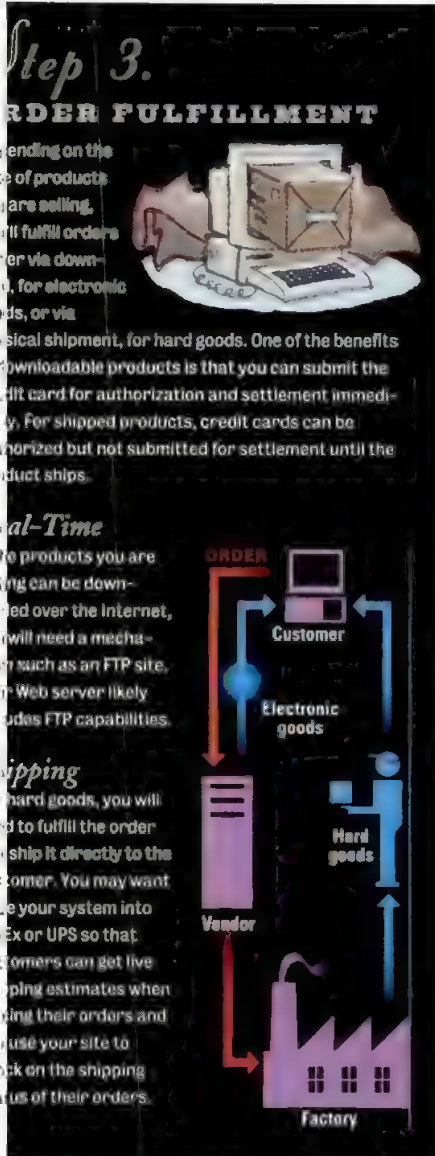
1. InterShop's form-based Product Manager lets you easily add or edit products, define suppliers, set display templates, and specify promotional Hot Deals. 2. InterShop is divided into Managers, all of which are instantly accessible with the consistent and intuitive navigation-button bar.

Design wizard. In our testing, we were able to create most of an online store using the Store Design wizard. You just select a template store, type of product, shipping parameters, and database characteristics. Although the wizard is good for creating a simple store, complex stores—those that require a lot of custom content, such as your own logos and graphics—will require a lot more work.

You carry out this customization with InterShop's easy-to-use interactive menus (to set more preferences) and TLE programming. Unfortunately, a good graphical-interface design system, such as Microsoft Site Server's, is missing. InterShop, however, lets you integrate your favorite site-building tool (for example, Microsoft FrontPage).

Using InterShop's Catalog Manager, you can create a store that lets you assign catalog and list templates to display product categories and product lists. You control stock through the Product Manager, which lets you search and delete items as required. You maintain customer and supplier lists through the Customer Manager, and the Inventory Manager checks to see how much of each product is on hand. All of this is done through a spartan and clunky browser-based interface that can work locally at the server or remotely from the client.

Inventory control is one of this product's strengths. Not only does the Inventory Manager track changing stock levels, but it also lets you view stock, enter new



packages are also available as add-ons. Administration is entirely through a Web browser in iCat, by way of its powerful Commerce Publisher tool. This feature makes it easier to administer the site if it's hosted remotely, as in an ISP relationship. While we expect big shops to have their own server hardware, this capability is a win for the company with a smaller e-commerce site hosted out-of-house. The admin-

products, and generate a list of inventory transactions. You can use such a feature to reorder stock automatically before you run out. Moreover, this provides transactionality, letting you roll back incomplete transactions if anything goes wrong. This means that you won't have an order for a golf club, for example, without knowing where it's going.

Discounting merchandise for quantity

Step 4.

SITE PROMOTION

For your site to be successful, people need to visit it. Generating traffic can sometimes be a daunting task, and you may want to avail yourself of tools for search-engine submission and monitoring, such as WebPosition Gold.

Banner Exchange

A banner exchange service such as Link Exchange is a low-cost way to generate site traffic and make your site look more professional. In exchange for displaying other companies' banners on your site via the exchange service, your banner will be displayed on other participating company sites in kind.



buyers is a simple matter of selecting Discounts from the Statistics and Preferences menu. You create a new discount class by entering the minimum amount needed for a discount, and the desired discount amount (say, for every golf ball order over 100, discount 10 percent). You can even enter date ranges when the discounts should be active and links to specific customer categories.

You define shipping costs in the same way, by creating a method from the shipping feature and entering the parameters for items, customers, location (via ZIP code). You can also gather up-to-the-minute shipping costs from services such as FedEx and UPS.

Be aware before installing and configuring Intershop, that it's a good idea to leverage its online update and patch feature to make sure you're working with the latest and greatest. Though most of the application files come from a CD, a com-

plete online installation may prove more valuable for combining two steps in one.

Bundled with Intershop is a Sybase System 11 Enterprise Database. You can use Sybase as is, or Intershop's ODBC support to get access to bigger databases including DB2 and Oracle. No native drivers are included with the product.

You'll need to set up a separate database for each store you build—to facilitate database partitioning for increased performance and logical grouping. (For example, it's conceivable that you'll have one store on DB2, another on Oracle, and another on Sybase, and that all will be using the same commerce server.) This is similar to Net.Commerce's mall concept, which lets ISPs host several distinct stores off one server.

Moving data into the production database is a breeze. Simply use the Data Import wizard and Intershop is automatically able to read, format, and place the data properly. We did have to do some additional massaging, such as reformatting a text file to be accepted by the data import feature, but for what is typically a one-time deal, this was not a problem.

Intershop has made tremendous improvements over its previous version of the product. We found its wizards among the easiest to use in this roundup. Unfortunately, we also found the TLE and other customization interfaces difficult to use.—DSL

Maestro Commerce Suite Professional Edition 3.0

\$4,995 list. BIT Software Corp., Westmont, IL; 877-455-6300; www.bitsoftware.com; 504 at www.pcmag.com/infolink.

● With BIT Software's Maestro Commerce Suite Professional Edition 3.0, even those lacking developer expertise can build and run an e-commerce Web site. With excellent, wizard-based site development and management and a good range of administration and reporting capabilities, this package offers an appealing solution, especially for busi-

nesses that want to mix e-commerce with traditional in-store sales and phone sales. Problems arise, because you can't extend the functionality of the wizard-created store. This is not the case with any other product in the roundup. If BIT hasn't added a feature you need, you're out of luck. If you customize your site, you can't go back to the wizards without overwriting all of your work.

Maestro's Site Conductor, the wizard for building your Web site, is the product's best feature. Like the wizards for the other products here, this tool generates your basic Web site. It bests others in the roundup by going beyond the basics. Maestro's wizard is exceptionally deep, with more than 20 screens letting you customize colors, graphics, and all the



1. The powerful Maestro Navigator is the command center for managing your e-commerce Web site. 2. Maestro lets the administrator choose from a useful array of predesigned reports.

options that your Web site will support. Unlike with other wizards, you'll typically return to Maestro's easy-to-use Site Conductor again and again.

Once your site is constructed, Maestro generates an ASP-based commerce Web site. In theory, all scripts are available for customizing, but Maestro lacks any specific developer API or special tags; it has only standard ASP code that interacts with the Maestro database. Maestro cannot compare with its competition when it comes to developer customizability. Any tweaks to scripts will be overwritten the next time the wizard is run (this liability is well documented in the user manual).

Setting up a Maestro Web site was simple. We relied on the wizards (called *conductors*) to do all the work. Unlike iCat



FOCUS ON YOUR CUSTOMER

Customer-focused, customer-driven. Over the past decade, the giants of Corporate America have made the customer their strategic centerpiece, investing huge sums in information technology to help them improve their customer relationships.

And, what they've been saying is, 'We have to start treating our customers like small businesses do...with the same personal attention to their needs and the same ability to customize a product or a service.'

While big businesses are using technology to play catch up with companies with one, five, ten, or 20 employees, small businesses all over the world are finding out they can use those same solutions to build their advantage.

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Software solutions can help small businesses serve their customers better than ever, while at the same time helping them improve their own productivity. There are software solutions that not only put the power of information technology at their fingertips, but also protect customers from the problems that systems can cause.

Symantec has spent nearly two decades providing such solutions to individuals, businesses and other institutions around the world, making them more productive and keeping their computers safe and reliable — anywhere, anytime.

"With such revolutionary developments as corporate downsizing, computing and the Internet, the number of small businesses around

you more touch and feel when it comes to your customers?

Understanding

Customer-driven means that a business offers its customers products and services they really need, rather than presenting "a product in search of a market." The price is right; the packaging and shipping is the way they want it; their operation is 24 hours a day, so your support is too. The best businesses are the ones that understand their customers well enough not only to see all this, but also to see what's coming around the bend.

It's never been an easy task. You need to know your customer base by market or geographic segment, but that's not enough. You need to

tools can help you maintain the professionalism and personal touch you've been known for, reminding you and your staff about important customer dates and events.

Responsiveness

Responsiveness on a day-to-day basis says you provide customers with the answers they need when they need them. So sales and service people — no matter where they are — must have instant, easy access to customer databases and the ability to transmit quotes, presentations, and even training programs to customer sites. Access can also be speeded by technology that, for instance, enables caller ID to bring up the record before the sales or service person says "good morning."

It doesn't matter what information your customer needs and how fast, there's a communication vehicle for getting it there and you have to use it all: e-mail, voice mail, fax, overnight delivery. For instance, computer-to-fax is the fastest way to get your customers hard copy. We're talking about hard copy you send from your computer that might contain a just-assembled combination of the latest promotions and product illustrations.

Further, your customers should be able to access your systems to obtain the same information via e-mail or "fax on demand."

Voice mail? It's your image, they say, and technology exists for any size company to make sure you sound right, respond quickly, and keep a record of calls and faxes.

Productivity

Being able to provide your customers with better products and ever higher levels of service, being

Be understanding, responsive, productive and protective. This is what being customer-driven is all about.

the world has exploded," says Symantec's Dana Siebert, VP, Americas. "This is great because small businesses have always been a major source of innovation and service. A primary goal for companies like ours has to be to help level the playing field for them and contribute to their growth.

"What we're saying here is they have an advantage — their understanding of and responsiveness to their customers — and we think we can help them keep it."

The Touch and Feel of Technology

What does it mean to be customer-focused and customer-driven? How can technology give

you know your customers individually and they need to feel that you do — that you know their business, you know them as people.

For instance, to create winning proposals over and over again, you want your customer's plans and the history of your relationship at your fingertips. We're not only talking volume, credit history, and the bottom line, but also the nuances of how you have worked together.

Technologically, both the top-down planning and the individual interaction require a customer database: an information file on your customers and their accounts — the notes, the phone discussion logs, the presentations and proposals.

As your company grows, software

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able to develop and retain close relationships with individual customers as your customer base grows — all this carries a cost to your business. You can't stay customer-driven as we've described if your resources are strained and your bottom line suffers.

The technology solutions we've noted above — the customer and prospect database, word processor, e-mail messaging and other communications tools such as computer-to-fax and the calendar — are also crucial productivity tools for your organization, allowing them to be responsive to customers literally at the push of a button.

To improve ease-of-use, while safeguarding your investment in new and older computing equipment, such tools must operate on all major computing platforms.

These tools are win-win solutions for the front lines of your business — the people who plan and deliver what the customer needs. You also need technology that protects your business and your customer's, and solutions exist for your back office to provide these safeguards.

Protection

Flash...computers are vulnerable and fallible. They crash, wiping out that 10-page proposal you hadn't saved. They can get viruses. Installing new programs can mess up your system. Worse, you can wipe out data on your customer. And, electronically connected to your customers, you can send them a virus that wreaks havoc on their systems.

The good news is that technology solutions exist to fend off these problems.

Small Business Solutions



ACT!™ turns contacts into productivity and results. This customer and calendar management software provides instant access to critical information about your customers and appointments and triggers reminder alerts to remind you of important items. ACT! supports Internet and e-mail access and lets you share information with your team.



WinFax PRO™ gives you hassle-free faxing right from your computer, allowing you to send your company's sales, including material from your ACT! database, to one or many customers. The tool also automates the scheduling of follow-up items. WinFax Pro includes Fax Sending, Fax Receiving, Fax Forwarding, and Fax Queue. WinFax Pro is also the industry standard for other WinFax PRO copies on the network.



TechWorks PRO™ makes a more professional image for small businesses with up to five employees. The sales and fax communications software provides fax scheduling, sends e-mail to your customers to find your computer and Internet status at any time, and sends e-mail to your customers. TechWorks PRO can tell you with immediacy if your system is down. Other features include customer management, tracking all calls and faxes.



pcANYWHERE™ helps you keep building customer relations where ever you are. From your field office in Detroit, you can carry on electronic sessions with your customers in New York, sending them training programs or presentations from your laptop or the corporate computer in Chicago. Naturally, pcANYWHERE 2.0 lets you access customer data at the same office. Many security features are built-in.



Norton AntiVirus™ eliminates today's and tomorrow's viruses. Norton AntiVirus is the best protection for you and any customers you are connected to electronically. PC Magazine, in giving this product the Editor's Choice award this year, called it "the best combination of speed, protection, performance, and usability." Testing laboratories confirm that it provides 100% detection of "in the wild" threats from any source, such as the Internet, floppy disks, and shared files.



Norton Utilities™ provides advanced problem-solving power and control by browsing, organizing, and optimizing most computer problems. A trusted solution for more than 10 years, Norton Utilities continuously monitors your system so you don't have to guess what's really in control when there's a problem. Worried about viruses and disaster-recovery techniques? As PC Magazine has stated, Norton Utilities is "the industry leader" in protecting against crashes—three times as effective as competitors—and provides advanced disaster-recovery capabilities.



As a small business owner, you know that keeping your customer in focus is critical to your success. That's why you need Symantec Small Business Software. You see, we've developed an entire line of products to help you be more productive and stay well protected. And that means more time to build a customer centered business with the least amount of PC downtime. Which is exactly the way it should be.



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and Site Server, which require a roll-up-your-sleeves approach to importing legacy data, Maestro, with its Import Conductor tool, made it a cinch to select fields from a sample database and pull them into Maestro's own database format.

The product ships with Sybase SQL Anywhere 5.5 and will also connect to Microsoft SQL Server for production. Maestro is generally easier to use than the

Step 5.

SITE MONITORING & ANALYSIS

Keeping track of who's coming to your site, how they're navigating it, and how they found it (via a banner ad or a search engine, for example) is key to determining how your site promotion efforts are faring. You'll need a log analysis tool, such as WebTrends, that will give you reports analyzing your traffic so that you can make any changes to the site or tweak your marketing efforts.



other products here, but you will need to know some SQL to write advanced queries.

The import takes your data (in any ODBC-compliant data source) and maps it into fields in Maestro's database, similarly to the way iCat imports data. A standout feature here is Maestro's ability to export daily database updates to Peachtree, QuickBooks, and SBT accounting packages so that your e-business can work with traditional inventory and accounting systems.

Because Maestro uses Microsoft's ASP technology, we were able to deploy our Maestro-powered test site on the Microsoft IIS Web server. The product bundles with Chili!Soft's Chili!ASP extension for deployment of Unix servers, but with its reliance on SQL Server 6.5 for deployment, the product is clearly most at home using Microsoft BackOffice.

You use Maestro's management console, Maestro Navigator, to administer a Maestro site. You continue to take advantage of wizards, using various conductor tools for managing product lines, sales, and

reporting, as well as other management functions. Maestro's administrator is a standalone client-server tool, unlike iCat's and Microsoft's, which offer both client-server and Web-based administration.

We were impressed by the range of functionality and control offered by the Maestro Navigator. It offers a highly visual interface for major functions so that sales staff can use it with minimal training. More than a dozen canned reports that show sales trends as well as other reports are available. For Web site analysis, the product bundles WebTrends, which lets Webmasters track site activity.

One distinct advantage here is that Maestro can handle multiple store locations easily, whether they are traditional retail locations, phone sales centers, or e-businesses. Like IBM's Net.Commerce, Maestro can support separate and distinct stores on one server.

For calculating shipping, Maestro includes hooks to TaxWare for figuring state and local sales tax. We also defined our own custom tax tables easily. Payment options include ATS and CyberCash, but Verifone support is missing. The product supports FedEx and UPS shipping right out of the box. In testing, we had no trouble adding a new table of shipping charges. Searching of all fields is automatically available, and Maestro's shopping basket feature worked well. All of these options can be added by using the Maestro Navigator tools without having to do any programming.

When it comes to reporting and fulfilling orders, Maestro performed well—with convenient reporting capabilities and automatic updates of stock from its inventory tables once orders are filled. Any additional legacy integration would be difficult to achieve in Maestro, at least compared with other products here, because of its lack of developer hooks.

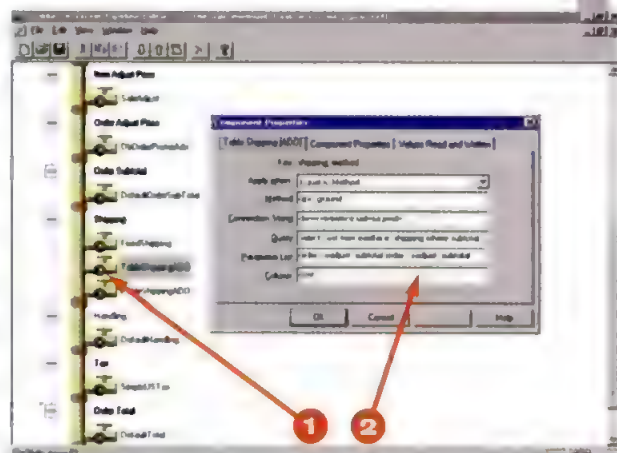
Companies that want to give e-commerce-site developers free reign should probably look elsewhere, but the range of customization offered in Maestro is respectable considering that it's all wizard-based.—*RVD*

Microsoft Site Server 3.0 Commerce Edition

\$6,498 list. Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com; 505 at www.pcmag.com/infolink.

● If you've committed to Windows NT in your enterprise, you're most likely going to choose Microsoft Site Server 3.0 Commerce Edition as your e-commerce solution. Working interdependently with Microsoft BackOffice and its development tools, Site Server gives you a handful of basic templates to get you started, and Visual InterDev to design and customize your site. Some developer expertise is needed to use Site Server, but if you plan to focus on Microsoft products such as IIS for hosting your e-commerce application, it's a good scalable option for you.

Site Server ships with Microsoft Windows NT 4.0 Option Pack and SQL Server 6.5 Service Pack 3. This bundling means the platform is rich with server-



1. Site Server's Pipeline Editor lets developers attach business rules to any step in the e-commerce process. **2. Webmasters** can customize every aspect of the process, such as custom shipping and tax tables.

side functionality, from IIS 4 to transaction management with Microsoft Transaction Server (MTS) and message queuing with Microsoft Message Queue Server (MSMQ).

A feature unique to Microsoft Site Server 3.0 Commerce Edition is its *pipelines*—nifty visual models that let you manipulate the order of business processes. There are two types of pipelines available: the order-processing pipeline and the Commerce Interchange Pipeline (CIP) for business-to-business transactions. Each pipeline is a model of the business process, with steps taken for e-commerce transactions—adding items to a shopping basket;

Though the mainstream products reviewed in this story will certainly let you sell products to customers over the Web, there's little doubt that e-commerce will soon expand into automating most business-to-business and in-house transactions. If your organization doesn't have the programming resources for the custom developments we review in this story, you can move to more powerful (and much more costly) solutions. But the potential is indeed great as e-commerce gets inte-

approved suppliers. CommerceXpert starts at \$75,000 and can reach \$300,000 for a typical set of options. The breadth and depth of this product, however, can save an organization a lot more over the long run in developer expertise and reduced business costs.

Backed by both Intel and SAP, Pandesic Web Business Solution (www.pandesic.com) relies on the power of Microsoft Site Server 3.0 Commerce Edition (reviewed in this story), but with vastly more built-in functionality for au-

High-End E-Commerce Options

grated into everyday corporate purchasing and supply. Both Netscape's CommerceXpert and Pandesic Web Business Solution can help more ambitious organizations get a head start realizing their e-commerce potential. And IBM's high-end solution, Net.Commerce Pro, offers similar features although it is geared more toward do-it-yourselfers (see the Net.Commerce Start 3.11 review).

Concentrating on the truly high end, Netscape's CommerceXpert (www.netscape.com) package mixes a balanced and powerful array of tools for automating almost every facet of your business's purchasing and supply, whether you're conducting business-to-business or business-to-consumer e-commerce. This package consists of separate tools that can automate different aspects of your business. Netscape's SellerXpert lets you get an e-commerce site up and running quickly, with control over visual styles and custom business logic.

Netscape's ECXpert brings automation to such facets of your business as electronic data exchange by using the Electronic Data Interchange (EDI) format. The DeveloperXpert tool lets developers integrate data and documents of all formats within an enterprise.

And the BuyerXpert tool lets you automate the procurement process, including the ability to create catalogs of

tomating virtually all facets of the business supply chain. Pandesic's model stresses the differences between *e-commerce* and the more comprehensive *e-business*, which can automate many aspects of business, with real-time management of shipping, inventory, replenishment, warehouses, accounting and financial reporting, and return processing.

The Pandesic solution (a basic configuration costs between \$25,000 and \$100,000) includes software developed by SAP for automating many business processes via e-commerce. It also includes custom installation/service and hardware.

IBM's Net.Commerce Start 3.11 gives you all the development tools to build and run your e-commerce site in-house. The Pro version (\$1,995) adds support for SAP, CICS, and MQSeries. SAP provides links throughout the supply chain, CICS is software for online transaction processing, and MQSeries is designed to facilitate correct transaction processing by ensuring that messages are acted upon in the proper order. Pro also has Product Advisor catalog extender, a smart search and filtering engine that lets users select attributes to narrow searches.

Any of these high-end products can jump-start your enterprise with an faster, cheaper way to do business.

—Richard V. Dragan

credit-card processing; order tracking, fulfillment and shipping; and so on.

Because all of the server-side features can be scripted and programmed through COM objects, the pipeline metaphor lets the Microsoft platform adapt to virtually any e-business scenario (including in-house supply). Code is attached to the steps in the pipeline so that at various stages, services are invoked, database tables updated, and so on, with transaction support as necessary. By default, Visual Basic for Applications (VBA) scripting is used, and right out of the box, about 123 COM objects are available for use with the pipeline. Third-party objects can be added to extend the reach of the platform.

The pipeline metaphor is the glue that holds all these various business rules together. Using the GUI pipeline editor, users can tweak or add code to various steps along the way—modifying shipping rates, for example.

Even though developer experience is needed, you are not on your own with Site Server. Getting started building an e-commerce site was relatively easy with the Site Builder wizard. This wizard provided over a dozen screens where we set options for our Web site, from the visual aspects to the desired feature set.

The basic model of a site includes all the core features, from a shopping basket to credit card support (through Microsoft

Wallet), as well as other necessities for a basic e-commerce Web site. Unlike the less developer-oriented catalog products such as iCat and Maestro, there is still some work to be done after running the wizard. Although you can start running an e-business using this default look and feel, all but the smallest businesses will want to customize first. This means working with Visual InterDev 1.0 (shipped with the product) to tweak ASP scripts and HTML.

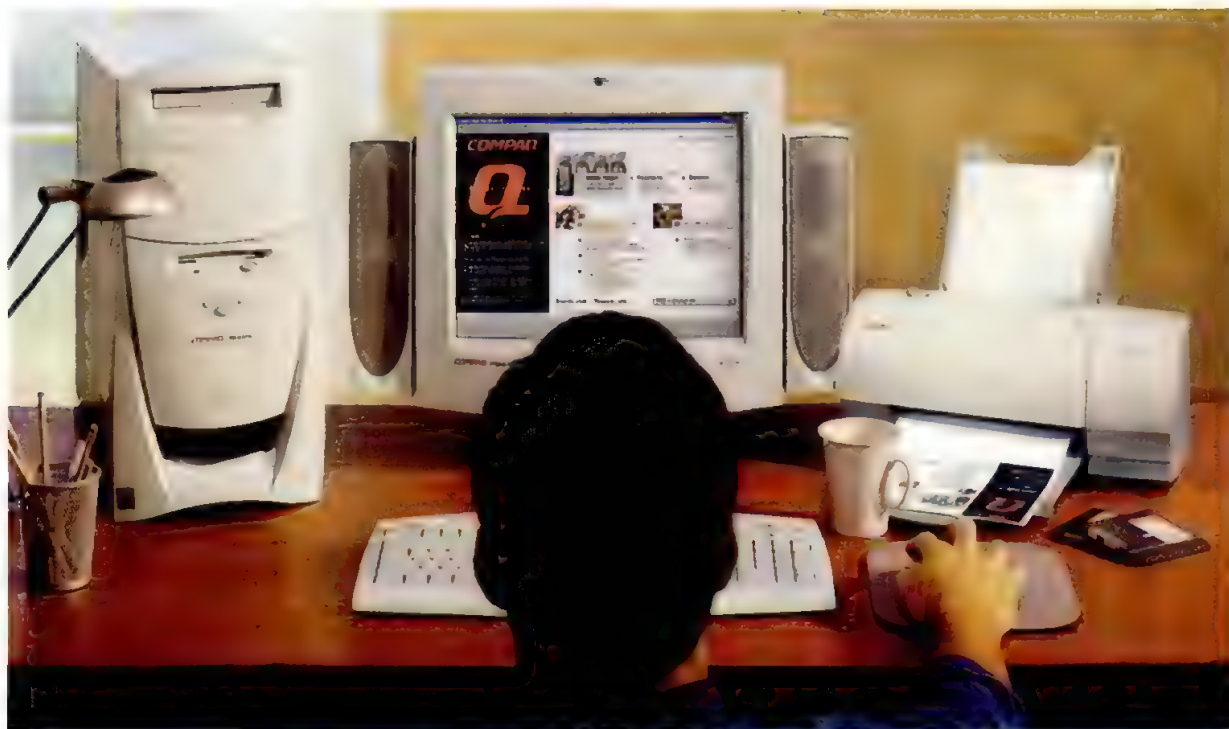
Site Server relies on SQL Server 6.5 for its native database access, and it also supports ODBC. Microsoft provides default data schemes that can be populated with your customer and product data. Unlike other vendors in this roundup

How do I make my personal computer
really personal?

Compaq Presario® 5600-450

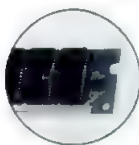


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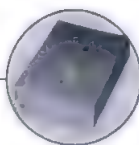
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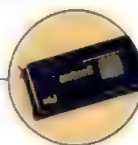
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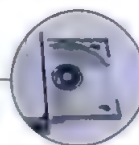
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Base price includes:

- Intel® Pentium® II Processor, 266 MHz
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- 64 MB SyncDRAM
expandable to 160 MB
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- 24X Max CD-ROM Drive²
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- Smart Lilon Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics
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- Microsoft® Office 97 Small Business Edition
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- 24X Max CD-ROM Drive²
- 56K ITU v.90 Modem³
- Smart Lilon Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics
w/2.5 MB VRAM
- Microsoft Office 97 Small Business Edition
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- 96 MB SyncDRAM expandable to 160 MB
- 6.4 GB UltraDMA Hard Drive¹
- 2nd-Generation DVD-ROM Drive⁴
- 56K ITU v.90 Modem³
- Smart Lilon Battery
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- 256-bit Accelerated Graphics
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COMPAQ
Better answers. SM

(such as BIT Software and iCat), Microsoft doesn't provide a separate visual importing tool for bringing existing data from other formats, but you do have a command line utility. We found the database schema flexible, however, in that it readily supported attributes for product lines, such as colors for clothing.

Site Server's promotional features proved powerful. Virtually any combination of database fields and rules can be used to create cross-promotions, sales, and customer-based promotions.

Site Server offers strong reporting and control over the Web site. The ASP-based Web site you create comes with administration and reporting capabilities for basic site maintenance and reporting, with over a dozen canned reports.

For actual Web site analysis, Site Server relies on the Usage Analysis and Content Analysis tools, which offers a high level of granularity for analyzing site activity—including excellent graphing. Site Analyzer is another example of the bene-

ficial integration of the Microsoft server-side tools, as it reads log files from IIS.

The Microsoft Site Server platform is an extensible and robust deployment platform. With the interdependent Microsoft Back Office server technology and extensible COM-based scriptable objects, developers can write e-commerce sites that take advantage of transaction management and other leading-edge features with relative ease. Though it demands at least a basic level of developer and Web design expertise, the Microsoft package has much to recommend it for e-commerce.—RVD

Net.Commerce Start 3.11

\$4,999 list. IBM Corp., Armonk, NY; 800-426-2255;
www.ibm.com; 506 at www.pcmag.com/infoink.



Leave it to a big company to come up with a big solution. IBM's Net.Commerce Start 3.11 is a highly configurable, scalable system that lets you build virtually any type of online store you want.

Thanks to the product's intelligent design, a wizard walks you through the process of building a basic store. After that, to create commands, you use a forms-based structure that lets you delve more deeply than you can with the wizards. You can then go still further by writing code.

To get you started, Net.Commerce has the Store Creator, a wizard similar to iCat's, which lets you build the basic store framework. The Store Creator provides three store types: One Stop Shop, a simple catalog service that lets your customers browse without registering; Personal Delivery, a more powerful consumer-based store that requires shoppers to log on; and Business to Business, a store with approval paths targeted at business buyers. The wizard gives a short description of each task and a flow chart, so you can see visually what each option offers. The Store Creator asks for a few answers, such as the store name, contact, and simple tax and shipping information. The wizard also lets you fill the store with bogus products for

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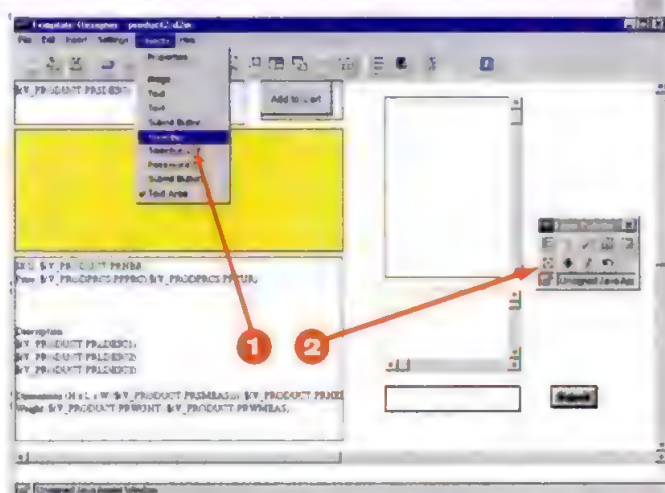
Once you've built the store framework, you can use the store manager to enter product information, pricing, and other attributes. You can also enter descriptions, thumbnail and full-size images, inventory information, shipping weights and handling charges, and URLs for downloadable products such as software.

For most stores, the category- and product-entry screens will fill the bill with preset information, but you can also enter up to five custom fields without programming. Here's where you may first run into difficulty with the product; some of the fields are not self-explanatory. The online help, however, is exceptional, giving concise info for each entry required. One snag we hit was that by default you have to enter dates in a year-month-day format, separated by hyphens, or you'll get an error message. While the requirement for this date format is documented, there's no simple way to change it. You'll have to

edit JavaScript files to replace the default date order and delimiters.

Those of you who need to dig deeper than the wizards or standard forms allow will have to explore Net.Commerce's object-oriented structure, which is based on a large library of commands, functions, and utilities. You can use existing commands, override existing functions, or write your own. Depending on the area of customization, programmers will need to work with JavaScript, Java, C/C++, or IBM's Net.Data macros.

Net.Data macros use HTML and embedded SQL statements to retrieve and display data from the Net.Commerce database. Net.Data is somewhat similar to



1. Net.Commerce's template designer window gives you a drag-and-drop environment for creating and editing templates to display your store's Web pages. 2. The Form palette toolbox gives you familiar form-creation tools.

iCat's Carbo, Intershop's TLE, and Microsoft's ASP. Though the glue is HTML, the objects are IBM's API.

You can connect Net.Commerce to your legacy systems natively through DB2 or to Oracle using ODBC. Because the

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SUMMARY OF FEATURES

See www.pcmag.com for interactive views

Web Storefront Software

PC MAGAZINE
EDITOR'S CHOICE

	AbleCommerce Developer 2.6	Cat@log 2.5	iCat Electronic Commerce Suite 3.0 Professional Edition	Intershop 3 Merchant Edition	Maestro Commerce Suite Professional Edition 3.0	Microsoft Site Server 3.0 Commerce Edition	Net.Commerce Start 3.11
■ YES ■ NO							
List price	\$3,495	\$7,950	\$9,995	\$4,995	\$4,995	\$6,498	\$4,999
Platforms supported	Windows 95, 98, NT 4.0	Unix, Windows NT 4.0	HP-UX, Irix 5.3, Solaris, Windows NT 4.0	AIX, HP-UX, Irix 5.3, Solaris, Windows NT 4.0	Unix; Windows 95, 98, NT 4.0	Windows NT Server	AIX, Solaris, Windows NT 4.0
Store Setup and Publishing							
Number of full storefront templates	4	5	21	50	6	5	3
Includes wizard for starting store	■	■	■	■	■	■	■
Includes HTML editor/WYSIWYG editing	■	■	■	■	■	■	■
Supports frames/tables	■	■	■	■	■	■	■
Forces frames/tables	■	■	■	■	■	■	■
Supports browser plug-ins/ActiveX/Java	■	■	■	■	■	■	■
Supports forms creation	■	■	■	■	■	■	■
Supports team development/hooks	■	■	■	■	■	■	■
Supports customer registration	■	■	■	■	■	■	■
Includes e-mail templates	■	■	■	■	■	■	■
Can customize user pages based on user data	■	■	■	■	■	■	■
Automatic deployment	■	■	■	■	■	■	■
Databases							
Includes database server software	■	■	■	■	■	■	■
Native drivers for Oracle/SQL Server/Sybase	■	■	■	■	■	■	■
Imports/exports database files	■	■	■	■	■	■	■
Maintains inventory/customer databases	■	■	■	■	■	■	■
Databases can be administered via browser	■	■	■	■	■	■	■
Transactions and Security							
Calculates shipping charges/state and local taxes	■	■	■	■	■	■	■
Shopping basket	■	■	■	■	■	■	■
E-mail order verification	■	■	■	■	■	■	■
Transaction/queuing support	■	■	■	■	■	■	■
Supports Checkfree/CyberCash/First Virtual	■	■	■	■	■	■	■
Supports SET / S-HTTP	■	■	■	■	■	■	■
Administration and Sales Support							
Mail support (multiple stores, same site)	■	■	■	■	■	■	■
Can check internal/external links	■	■	■	■	■	■	■
Analysis tools for tracking visitors	■	■	■	■	■	■	■
Version control/VC hooks	■	■	■	■	■	■	■
Can create promotions/allows dynamic discounting	■	■	■	■	■	■	■
Shipment tracking	■	■	■	■	■	■	■
Generates invoices/sales reports/inventory reports	■	■	■	■	■	■	■
Links to legacy accounting systems	■	■	■	■	■	■	■
Client-based/browser-based administration	■	■	■	■	■	■	■

product supports ODBC, you should be able to use any other ODBC-compliant database if you choose. You'd be on your own, however, since IBM has tested Oracle only and won't support the others.

Unlike AbleCommerce or Intershop, Net.Commerce lacks a great way to import data. You have to break data down into a normalized format and then import with a command line utility. What this means is that if you have an existing inventory with product prices, descriptions, colors, sizes, and other attributes, you must create an import file with data broken into separate tables using special

tags, similar to HTML tags. The format IBM uses is logical, but you don't get a utility to create the file, and that makes the import process more difficult.

Net.Commerce's Java- and JavaScript-based management front end lets you easily administer individual stores—or the whole site if you've chosen to build and run several stores under one virtual roof. The entire site is driven from the database, so you have great flexibility. You can manage the site either directly on the live server or via an off-line staging server. Currently, if you work off-line, you must manually upload changes with a command

line utility or your own FTP client.

You'll find installation and configuration easy and well documented, especially if you use the bundled DB2 database and Lotus Go Web server. You'll also need to install Netscape Navigator 4.0 or later with Java 1.1 support to use the management console. IBM also supports Netscape Enterprise Server as the Web server and documents the setup.

Net.Commerce, with its detailed setup and administration capabilities and robust set of APIs, is a good choice for a growing Internet business willing to invest time in a site that works.—Jay Munro **PC**

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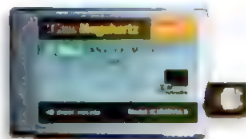
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(It doesn't get any easier than this.)

BY DON LABRIOLA

PC pbxs

COME OF AGE

Today's PC-based small-business PBXs provide most of the features of legacy systems yet are easier and less costly to implement and maintain.

Ten years ago, many experts predicted that the then-new digital private branch exchange (PBX) telephone systems would preclude the need for separate data networks. Virtually immune to crashes and fully compatible with existing telephone wiring, digital PBXs had great technology. But they also had proprietary connections, high prices, and the wrong sponsors within corporations. Open standards swayed corporate IS departments, and Ethernet triumphed.

Today, it looks as if local networks will gobble up voice traffic. We brought a new generation of PC-based PBXs into our labs and found them ready for business. Sold by local system integrators, each package consists of a Microsoft Windows NT

server connected to telephone handsets and incoming trunk lines through specialized interface devices. They match traditional phone systems feature for feature, and most also let end users bypass tedious button pushing by managing calls with a Microsoft Windows desktop application.

WHY YOU NEED ONE

Aimed primarily at businesses or branches with no more than 100 employees, PC PBXs provide numerous advantages over proprietary phone switches. Because they're built on open, extensible platforms, PC-based models are easier to upgrade and maintain. They have their own automatic call distribution (ACD) and interactive voice response (IVR) features (see "PC-Based PBX Terms") and interface with PC-based third-party products, such as fax, e-mail, and videoconferencing systems.

PC-based PBXs can also produce significant savings in recurring costs. Installation costs rival traditional PBX systems at \$300 to \$600 per port, but a PC-based PBX avoids the

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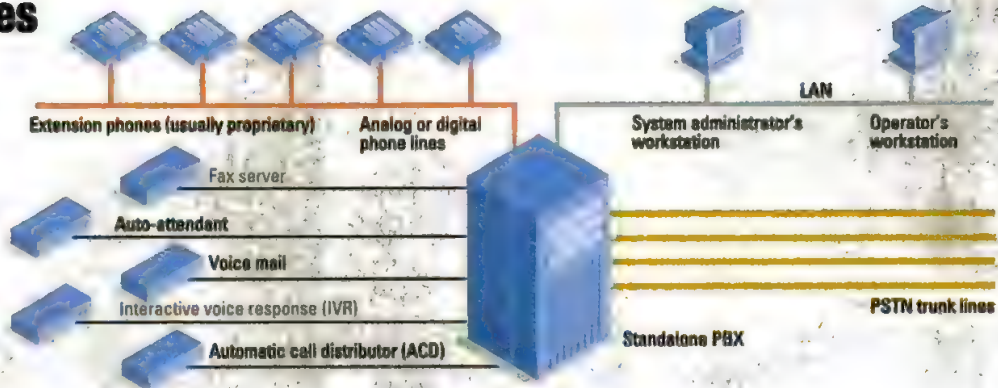
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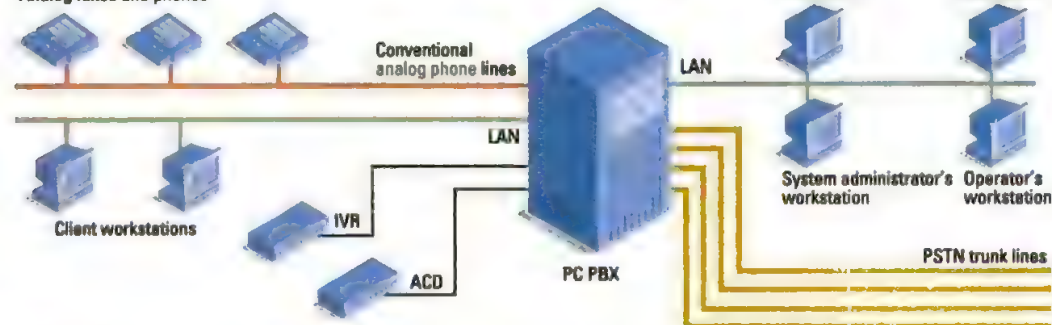
PBX Architectures

Traditional PBX

This high-speed switch, which has its own processor and proprietary operating system, connects proprietary telephone instruments to trunk lines. Initial per-user costs generally run from \$300 to \$600. Maintenance and service costs are high, and users need lots of training. These systems provide rock-solid reliability, but functions such as voice mail and call distribution require pricey add-on modules.



PC PBX

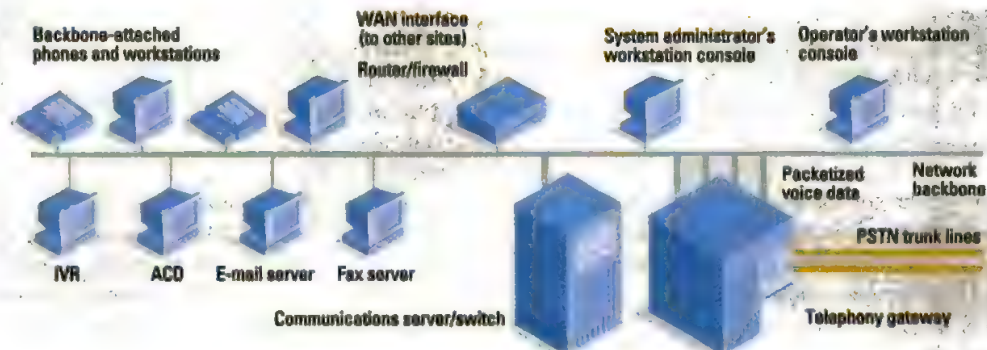


PC PBX

This solution offers competitive features and runs on nonproprietary operating systems and hardware. Initial per-user costs are higher than those of a traditional PBX, and you can't scale up to more than 144 extensions, ports, or trunks. But a PC PBX includes such functions as an auto-attendant, e-mail, and voice mail at no extra charge, and it's easy to administer and maintain.

LAN PBX

This setup converts calls into packets and routes them over a data network. External calls are converted to packets via a telephony gateway. A communications server performs PBX-style switching functions, directing packets to special network-attached digital telephones or telephony-enhanced PCs. Special quality-of-service (QoS) network techniques guarantee each call the bandwidth needed to ensure acceptable audio quality.



plethora of ongoing fees for Centrex services such as three-party conferencing and Call Forwarding, and it can eliminate the need to bring in outside technicians every time you add, move, or reconfigure an extension. PC PBXs can also employ low-cost telephones instead of pricey proprietary models.

Maintaining a traditional proprietary phone system can entail considerable costs for training administrators, operators, support personnel, and end users. But PC-based systems let you take advantage of existing in-house Windows

and LAN expertise, reducing training requirements, eliminating redundant staffing, and providing a single point of support for both the data and telecommunications networks. It's far easier to train even the most technophobic users on a system that employs the familiar Windows GUI than one based on the proprietary interfaces common to traditional switches.

Installing and configuring a PBX may be no more complicated than setting up any other Windows NT server, but it requires familiarity with both data net-

working and telecommunications—a combination of skills hard to find in smaller businesses. PC PBX vendors address this problem by selling only through VARs, which configure and deliver their products as tested systems.

THE CURRENT FIELD

In this feature, we look at four new PC-based PBX offerings, from Altigen Communications, Artisoft, IBM Personal Systems Group, and Shoreline Teleworks. All four offer features, ease

Our Contributors: DON LABRIOLA is a frequent contributor to *PC Magazine*. LES FREED is a contributing editor. RUSS IWANCHUK was the project leader, and TONI F. KISTNER was the associate editor in charge of this story.

Visit our Web site to check out this feature and our other networking coverage.

of use, and pricing that are competitive with—and in some cases, far superior to—those of traditional PBX systems. All include client software applications that let users manage, screen, and route incoming calls without using telephone buttons.

Although we would trust any of these products in a business environment, a relative unknown—the AltiGen AltiServ—walked over the competition in terms of features and value. It's our Editors' Choice. The IBM Small Business Computer Telephony Solution is a strong hardware and software package with outstanding client software. The Shoreline Teleworks CrystaLAN Voice Communication System has a unique distributed PBX architecture that improves reliability, but it also has a heady price. The fourth product we saw, the Artisoft TeleVantage 2.0, is a practical system with reasonable prices and some useful features. Right now, though, PC PBX systems can't compete with their mainframe cousins in scalability or reliability. And this is why they are the most appropriate for small businesses.

PBX: THE NEXT GENERATION

The good news is that PC PBX technology is moving fast. Although all the products reviewed in this feature are recent releases, most are due for upgrades in the next few months. Imminent enhancements include PCI-based telephony boards, which let you add new extensions and trunk lines without interrupting service, and the ability to accommodate high-speed T1 lines, which permit 24 calls per line at only four to eight

times the price of a traditional trunk line taking only one call at a time.

All the manufacturers we spoke to are working to improve *availability*—how much functionality their products maintain during crashes and outages—by certifying them on high-redundancy PC platforms like those configured in mission-critical LAN applications.

PC-based PBXs will continue to evolve. LAN-based systems, just emerging, move digitized voice across the data

Editors' Choice

• AltiGen AltiServ



In this, our first roundup of PC-based PBX systems, we found that all four of the products we reviewed come out ahead of traditional PBX systems in terms

of value and cost of ownership. And all the products incorporate advanced features that you'd probably pay much more for in an old-style PBX. The differences among the systems we reviewed, though, come down to product maturity, usability, and price. In all three categories, the AltiGen AltiServ easily beat out the competition.

The AltiServ has been on the market for over two years. One sign of AltiGen's experience in this field is that the vendor makes it very easy for users to handle management and maintenance themselves, without having to rely on VARs for every task. Configuring new users, for example, is a snap: You just plug in the phone and type the extension into your handset.

You'll also find the most advanced call-management, routing, notification, and security features in this product, along with a module that lets you integrate e-mail and voice mail. The AltiServ's interface is simple to use, making tasks such as returning phone calls as easy as pressing one button on your touchpad. The product's documentation is comprehensive and helpful.

As for pricing, no other product came close to the AltiServ: A typical configuration, bought through a VAR, costs \$29,390. The IBM Small Business Computer Telephony System came closest in price (\$34,235) for the same configuration. And the Shoreline Teleworks CrystaLAN Voice Communication System topped out at a whopping \$59,355.

network infrastructure. But this certainly doesn't mean that today's pioneering products aren't worth your consideration. With proper planning and attention to detail, they can provide service approaching that of conventional telephone systems without the hassles and costs of traditional PBX systems.

Read on to see how the four PC-based PBXs in our roundup fared.

AltiGen AltiServ

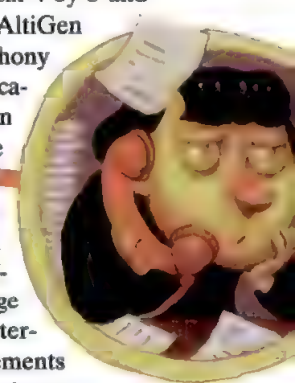
Typical configuration (24 trunks, 72 extensions): \$29,390.
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With more than two years of successful implementations under its belt, the AltiGen AltiServ, from AltiGen Communications, is the most mature and stable product here. Its broad functionality, superior ease of use, and competitive pricing made it a shoo-in for this year's Editors' Choice.

We tested a typical AltiServ configuration, consisting of a PC equipped with the AltiWare Open Edition 2.1 application server software, six 4-by-8 and two 0-by-12 AltiGen Quantum telephony boards, a harmonica-style distribution panel, and the AltiReach browser-based remote interface, which lets users set preferences and manage calls over the Internet. (Measurements denote trunk lines by extensions.) If you plan to complement the system's integrated auto-attendant with a live operator, you'll also want the optional \$495 AltiConsole software, providing an easy-to-use graphical front end for operators.

Quantum cards come in several configurations, making it possible to install a combined total of 144 trunk lines and sta-



tions. The current boards accept only single-line analog trunks, but AltiGen expects to add a T1 interface in the first quarter of 1999. Assuming a 3-to-1 ratio between trunks and stations, the system cost per user (including the AltiConsole) ranges from \$550 to a reasonable \$400.

A VAR will install the AltiServ initially, but the management software makes it easy to handle subsequent management chores in-house. Trunk lines and Quantum boards auto-configure themselves in a few seconds, and the usually onerous task of adding a new extension is as simple as plugging in a phone and entering its extension number from the handset. Most other configuration and maintenance tasks are just as easy, thanks to an elegant administrator interface and well-written documentation. The system provides a comprehensive selection of reports, as well as the ability to perform management chores remotely over a dial-up link.

As the features table shows, the AltiServ can do anything you're likely to want. Its robust Caller-ID-enhanced voice-mail system lets you return a call simply by pressing a single touchpad button, and it

Suitability to Task

	AltiGen AltiServ	Artisoft TeleVantage 2.0	IBM Small Business Computer Telephony Solution	Shoreline Teleworks CrystalAN Voice Communications System
Functionality	Excellent	Good	Fair	Fair
Usability	Excellent	Excellent	Good	Excellent
Availability	Fair	Fair	Fair	Fair
Scalability	Good	Good	Good	Good

For **functionality**, we evaluate the comprehensiveness of each PBX's feature set. We look at how well the product implements common functions such as call handling, routing, and notification, as well as more specialized functions such as automated attendants, IVR, e-mail integration, and voice mail.

Usability is important both for nontechnical end users and for administrators performing upkeep of the PBX. An extensive feature set isn't very useful if a user can't navigate the interface. We consider the quality of the administrative and end-user GUIs and telephone-user interfaces (TUIs) and of the documentation.

Having a working telephone system is essential to your business. We consider the **availability** of each system—the ability to remain ready for use despite hardware, software, and power failures. We look at how the system handles these events and ascertain what functionality still exists during various types of failure.

Scalability is the ability of each PBX to accommodate the needs of an expanding user base. We look at the total number of trunk and station lines each PBX can use, the status of its support for faster trunk connections (digital connections such as ISDN), and the process of expanding a PBX's capacity.

boasts such advanced features as dynamic call balancing, which routes incoming calls to the least busy agent, and the ability to play up to five different recordings to callers on hold. The AltiServ includes a MAPI-compliant e-mail module capable of seamlessly merging e-mail and voice mail, with an auto-attendant system powerful enough to generate front ends rivaling the power of low-end IVR applications.

Despite its strengths, the AltiServ isn't perfect. As with the IBM and Shoreline Teleworks products, a crash or power outage reduces the AltiServ to a single extension and trunk line per interface card. By contrast, the Artisoft product leaves you with several trunk lines per card. The AltiServ doesn't provide operator and administrator access over the Internet as does the CrystalAN product, and we don't like the idea of forcing buyers to pay an extra \$500 for an operator's console. Like all of the systems we reviewed, the AltiServ has yet to offer T1 or ISDN interfaces.

Nonetheless, AltiServ's unbeatable combination of usability, functionality, and value makes it the best PC-based PBX we've seen.—DL

Artisoft TeleVantage 2.0

Typical configuration (24 trunks, 72 extensions): \$37,542. Cambridge, MA; 800-914-9985; www.artisoft.com; 901 at www.pcmag.com/infolink.

● Though it doesn't have all the features of the AltiGen AltiServ, the Artisoft TeleVantage 2.0 is a very capable system. The TeleVantage comes from VARs as a turnkey server configured with application software, ISA-bus Dialogic telephony cards (PCI boards are due in early 1999), external Dialogic patch panels, cabling, and a power supply for the Dialogic hardware. Each card connects to either single-channel trunk lines or standard analog telephones, and Artisoft plans to begin shipping T1 interfaces by the end of this year. The system can handle up to 48 trunks and 144

Five Things to Consider Before You Sign

1. Appoint a PBX guru.

You'll need at least one person who can talk the talk with all the equipment and service providers needed to keep things running smoothly.

2. Analyze your infrastructure.

Would this be a good time to upgrade to a structured cabling scheme or migrate those unsightly punch-down blocks to a bona fide wiring closet? Should you prepare now for future growth by adding extensions and trunk lines or by replacing those expensive single-channel trunks with T1 lines?

3. Decide which tasks to handle in-house.

Running a PC PBX requires a broad range of hardware, software, communications, cabling, line-configuration, and training skills. You might save a few bucks by contracting multiple service providers

or by managing some chores in-house. But you can also simplify your life by choosing one VAR with the expertise to provide a single point of support. When deciding which tasks to farm out, consider such factors as service-contract costs, resource availability, and response-time requirements.

4. Choose a front end.

Do you want callers to reach a live human, or would you prefer to save money by directing incoming calls to an auto-attendant?

5. Don't forget about fault tolerance.

Be sure the RFP (request for proposal) you present to VARs mentions items such as high-redundancy servers, uninterruptible power supplies, hot-pluggable hardware, automated backup systems, and clustering options.



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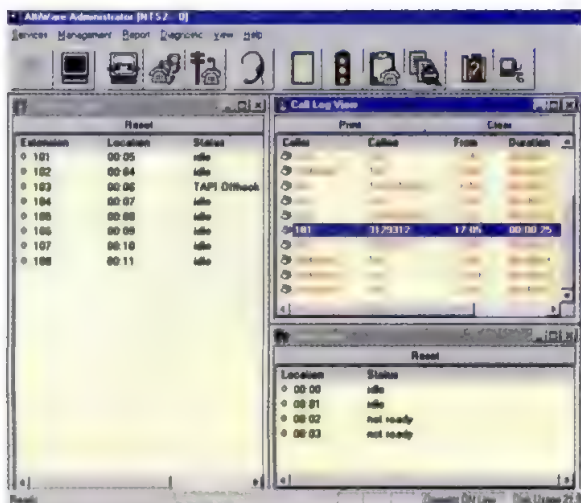
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The Altiserv's administrator console holds all the information you need to manage calls, trunks, user configurations, and hardware status in a single screen.

extensions, a software limitation the company expects to overcome during 1999.

A VAR will initially handle the installation and configuration tasks, but you should watch out for the confusing pricing scheme. In addition to the server license, Artisoft charges a fee for each board's physical port, as well as for an additional \$115 client-software license for each user running the TeleVantage desktop call-handling application. When you finish

crunching the numbers, the system's price per user hovers between \$475 and \$500, depending on configuration. These figures don't include PC or VAR service options and assume that every available extension uses the client software.

The TeleVantage lacks some advanced features, such as interactive voice response (IVR), an e-mail server, and browser-based remote access. But the features it does offer are all top-notch. A flexible auto-attendant integrates a broad selection of notification, routing, conferencing, and call-screening functions.

A true ACD module will be available with the imminent release of Version 2.1, but this edition's attendant is flexible enough to provide some ACD functions. The TeleVantage doesn't match the Altiserv's robust reporting and diagnostic capabilities, but it includes a real-time call monitor and a straightforward call-logging feature that ought to satisfy most users.

In our hands-on testing, we found the system quite simple to use. It ships with

outstanding documentation, and its intuitive graphical user interface makes adding, moving, and changing users easy. Interesting to note, we ran into a compatibility problem with a Dell OptiPlex GX1 PC. A good VAR should know about any reported problems and deliver a tested and integrated system to you.

Reliability is another strength. Artisoft has certified the TeleVantage for use with RAID storage devices, and like the IBM product, the TeleVantage includes a one-click database feature that quickly backs up configuration data to a local or networked drive. Simple directory structures store call logs and voice messages, which makes setup of automated backup procedures a breeze. You can restart trunks and station ports that lock up from the administrator's console without stopping the server, and the system will retain one extension per trunk—not merely one per interface board as with the other PBXs—in the event of a power outage.

The TeleVantage 2.0 may have a few missing pieces. What you'll find there, however, is strong. If you don't need an automatic call distribution system, browser interface, or e-mail system, this Artisoft product is definitely worthy of your consideration.—DL

PC-Based PBX Terms

ACD (automatic call distribution) system evenly distribute incoming calls among banks of call handling agents. They manage queues of on-hold callers and use flexible call-balancing algorithms to determine which agent receives each call.

An **automated attendant (auto-attendant)** is a software module that lets you create "voice mail" to handle incoming calls. Sophisticated auto-attendants provide a large selection of call-routing and notification options, as well as the ability to create complex, multilevel menu systems.

Caller ID pop-ups are floating windows that appear on the user's screen when an incoming call arrives. Using Caller ID and stored database records to identify the caller, they let you screen incoming calls and define caller-specific greetings and routing procedures.

Call notification is a phone-system feature that sends an automatic fax, e-mail, or text message to an internal or external phone number when a user receives voice mail.

Console programs are applications that let administrators, operators, and users manage calls.

Extensions are individual phone numbers assigned to specific users or departments. They can be used to route calls to the appropriate person or department.

IVR (interactive voice response) systems add a layer of automation to a standard auto-attendant, allowing users to create sophisticated voice-based menus and routing options.

Operator is a live person who manually receives incoming calls, transfers calls, sets up conference calls, and handles other call-handling operations. Most PBX systems have a dedicated operator console.

Port is a physical interface that can be connected to either a trunk line or a telephone extension. In a PC-based PBX, ports are provided by add-in telephony cards.

PSTN (public switched telephone network) is a public telephone system that uses a central switch to route calls between different locations.

Quality of service (QoS) is a measure of the quality of a communication service. It is often used to describe the quality of a voice call, such as the clarity of the sound and the absence of background noise.

Toll quality is the quality of sound produced by a telephone system. It is often used to describe the quality of a long-distance call, such as the clarity of the sound and the absence of background noise.

Trunk lines are external phone lines leased from your local phone company. They are used to connect the PBX to the outside world.

Trunk is a physical interface that can be connected to either a trunk line or a telephone extension. In a PC-based PBX, trunks are provided by add-in telephony cards.

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● Although IBM may not win any awards for clever product names, at least its names are descriptive. The IBM Small Business Computer Telephony Solution (CTS) bundles an IBM server, one or more NetPhone telephone interface cards, and IBM's Call Manager

client software. IBM targets the CTS at the 10-to-100-user marketplace and sells through a network of value-added resellers (VARs), which provide all installation and customer-support services. Pricing varies according to the model of IBM server you choose, but our standard configuration was more expensive than that of the Altigen Altiserv. We were surprised that the system didn't offer more features for the price.

Our test system came equipped with one NetPhone PBX-618 ISA card. Each

PBX-618 card connects six phone lines and 18 telephones. IBM also offers an expansion board that connects 24 phones. You can mix and match the 6-by-18 and 0-by-24 cards as needed, with up to six cards in a system. All six cards can share a single IRQ line, which helps to minimize installation hassles.

The CTS server application provides voice mail, phone directory, and call-routing services for the phones and client PCs. IBM Call Manager, a companion application, runs on the client PCs. Call Manager's display uses two main panes to show real-time call-status information on one side of the screen and the user's choice of a call log, phone directory, or workgroup display on the other. We found the workgroup display especially useful: It can display the name, extension number, and status (on the phone, away from the desk, and so on) of several coworkers.

A toolbar across the top of the window provides quick access to call-transfer and voice mail functions. Voice mail is handled by a separate application that starts automatically when you click on one of the voice mail icons. The voice mail program integrates with MAPI-enabled e-mail servers (such as Microsoft Exchange Server) so you can send voice mail messages via e-mail.

The CTS system includes some attractive administrative features. As with the Altigen and Artisoft products, a trunk-reservation system lets you designate each trunk line as inbound-only, outbound-only, or both inbound and outbound, so you can make sure you always have a line free for outbound calls.

Although we liked the basic feature set of the CTS system, we found the voice mail and auto-attendant less robust than those of the Altigen Altiserv. As we were completing our testing, though, IBM advised us that it will make available a new model of the CTS system by the time you read this. The new model will use PCI-based interface cards and add enhanced voice mail, a greatly improved auto-attendant, and a browser-based administration program to the system. Pricing is expected to be the same, and the new version of CTS will be available as a software upgrade for existing users.—Les Freed

SUMMARY OF FEATURES

PC-Based PBXs

	Altigen Altiserv	Artisoft TeleVantage 2.0	IBM Small Business Computer Telephony Solution	Shoreline Teleworks CrystalLAN Voice Communication System
■ YES ■ NO				
Price of typical configuration (24 trunks, 72 extensions, PC, monitor, network interfaces, all software and licenses)	\$29,390	\$37,542	\$34,235	\$59,355
Automated attendant/Automatic call distribution	■ ■	■ ■	■ ■	■
Interactive voice response/voice mail	■ ■	■ ■	■ ■	■ ■
FAX capabilities	■	■	■	■
SMTP/POP3 e-mail server	■	■	■	■
Unified messaging	■	■	■	■
Capacity				
Maximum number of ports, extensions, trunks, lines	120 / 100 / 20	196 / 144 / 48	144 / 108 / 36	144 / 144 / 144
Maximum number of simultaneous calls	255	96	54	144
Communications and Interfaces				
Trunk interface type	Analog loop start	Analog loop start T1	Analog loop start	Analog loop start, DID
LAN integration protocols	TCP/IP	TCP/IP (client and server) Windows NT Streams (server)	TCP/IP	Ethernet, HTTP, TCP/IP, VoIP
FTP server/JAVA interface	■	■	■	■ ■
Call-control and messaging APIs	MAPI 1.0, TAPI 2.1	TAPI	TAPI, TSAPI	TAPI 2.1
Calling Features				
Maximum number of parties in conference calls	6	7	8	3
Caller ID/Message notification	■ ■	■ ■	■ ■	■ ■
Dial by name/floating extensions	■ ■	■ ■	■ ■	■ ■
Call Forwarding/Call Waiting	■ ■	■ ■	■ ■	■ ■
Call transfer (internal/external)	■ ■	■ ■	■ ■	■ ■
Toll restriction/Outside call blocking	■ ■	■ ■	■ ■	■ ■
Message or music on hold/Distinctive ring	■ ■	■ ■	■ ■	■ ■
Message waiting indicator	■	■	■	■
Internet message retrieval	■	■	■	■
Fault Tolerance and Security				
Hot-pluggable hardware	■	■	■	■
Automatic line bypass	■	■	■	■
Administrator and user security mechanisms	■	■	■	■
Clustering capabilities/Disk mirroring	■	■	■	■
RAID support/Automated backup	■ ■	■	■ ■	■ ■
Software				
Configuration manager/Diagnostics	■ ■	■ ■	■ ■	■ ■
Application builder	■	■	■	■
Real-time status monitor	■	■	■	■
Monitor has remote capabilities	■	■	N/A	■
Web-based/LAN-based remote administration	■ ■	■ ■	■ ■	■ ■
Built-in/custom reports	■ ■	■ ■	■ ■	■ ■
N/A—Not applicable. The product does not have this feature.				

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HOW WE TESTED

PC-Based PBXs



We attached each PC-based PBX to an Ethernet test network consisting of three Dell OptiPlex GX1 client PCs, each with a single Pentium II/400 processor and 128MB of RAM. Two of the OptiPlex units were running Microsoft Windows NT Workstation 4.0 and one was running Windows 95; the PBX client software we tested supports both operating systems. If the PBX was not shipped as a shrink-wrapped unit with all the software installed on a system (as was the IBM product), we installed it onto one of the two PCs we used: a Compaq ProLiant 1600R with a Pentium II/266 and 512MB of RAM for the AltiGen AltiServ and the Artisoft

TeleVantage 2.0, and a Dell OptiPlex GX1 with a Pentium II/400 and 128MB of RAM for the Shoreline Teleworks CrystaLAN Voice Communication System. Machines hosting PBX services ran Windows NT Server 4.0 with Service Pack 3.

On the telephony side, we ran two standard telephone lines to the trunk ports of each PBX. For our station lines, we attached three standard push-button telephone sets to each PBX, one for each client PC on our network.

On the telephony side, we ran two standard telephone lines to the trunk ports of each PBX. For our station lines, we attached three standard push-button telephone sets to each PBX, one for each client PC on our network.

Shoreline Teleworks CrystaLAN Voice Communication System

Typical configuration (24 trunks, 72 extensions): \$59,355. Mountain View, CA; 888-258-4436; www.shoretel.com; 903 at www.pcmag.com/infolink.

● The Shoreline Teleworks CrystaLAN Voice Communication System has a unique distributed PBX configuration that makes the system easy to set up and adds reliability. But with prices ranging from \$580 to over \$1,000 per user, the CrystaLAN is also the most expensive product in our roundup.

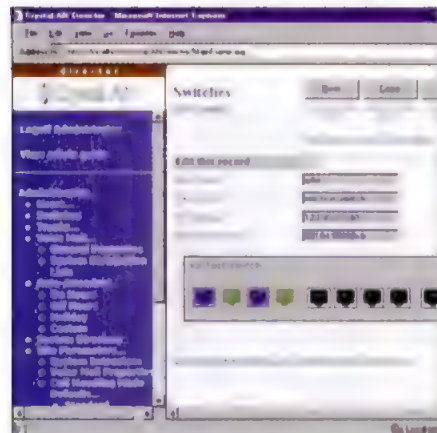
The CrystaLAN system consists of as many as a dozen IPBX-12 switch units (\$2,695 plus \$3,850 per unit for software licensing), CrystaLAN server software

(\$3,995) running on a Windows NT Server machine, and user PCs running the CrystaLAN client software. Each CrystaLAN IPBX-12 is a small box about the size of an Ethernet hub containing 12 phone line

connections (for either phones or trunks), switching circuitry, and an Ethernet port. Each box connects to a PC running Windows NT Server through the Ethernet connection. If you need more than 12 ports, you can stack up to 12 CrystaLAN units.

The Windows NT Server's software provides management, configuration, and voice mail service for the PBX system. This arrangement lets you put the CrystaLAN units close to users while the server is secured someplace else. Because IPBX-12 units do all the switching, the system can continue to place and receive calls even if the server PC crashes.

Although the CrystaLAN uses IP for switch-to-switch and switch-to-server communications, it's not a voice-over-IP system. Voice data travels over the IP network only when one CrystaLAN server needs to communicate with another or when the server needs to send or receive audio to or from a switch—to record an incoming voice mail, for example. Shoreline recommends that you create a separate LAN segment when connecting three or more CrystaLAN units.



The CrystaLAN Director's multitiered menu lets you choose a configuration task without drilling through a stack of menus.

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PBX Features Compared

	Traditional PBX	PC-Based PBX	LAN PBX*
SCALABILITY AND CAPACITY Ability to accommodate changing requirements and increasing numbers of users.	Excellent	Fair	Good-Excellent
AVAILABILITY Ability to retain functionality during system crashes or power outages	Excellent	Fair	Fair-Excellent
FUNCTIONALITY Selection of call-handling, routing, and notification features as well as ACD, e-mail, and voice mail.	Poor	Good	Good-Excellent
EASE OF USE for administrators, users, and operators.	Poor	Good	Good-Excellent
COST OF PURCHASE AND MAINTENANCE Availability in configurations to suit any budget.	Fair	Good	Fair-Excellent
INTEROPERABILITY Ability to interface with third-party data and telephony applications.	Poor	Excellent	Excellent
AUDIO QUALITY compared with standard toll-quality sound.	Excellent	Excellent	Good-Excellent

* LAN PBX systems vary in design much more than those in the other two categories. Therefore, we use ranges for most of the ratings.

The CrystaLAN's browser-based administration console is very easy to understand and use. Although VARs normally sell, install, and service the systems, we think most users can easily perform their own system maintenance beyond the initial configuration.

CrystaLAN's Java-based Desktop client software provides access to the system's call-control, voice mail, call-logging, and dialing-directory features. The call-control feature lets users transfer, confer-

ence, and forward calls using a point-and-click interface. Voice mail messages are stored as WAV files, so users can play them back on their PC speakers or attach them to e-mail messages.

Although we were impressed with the CrystaLAN system, we noted a few shortcomings. It has no flexibility in designating trunks for specific use and no IVR features. The CrystaLAN's auto-attendant is simple to configure but doesn't provide nested attendant menus

like those in the AltiGen product.

We're also concerned about the pricing. A 12-port system (with three lines and nine stations) works out to \$1,171 per user, not counting the cost of the Windows NT Server machine and license—nearly twice the price of some competing systems. Almost \$4,000 of the price is the server software license, so the per-seat price drops rapidly as you add more users. But even with 144 users, the CrystaLAN costs a pricey \$575 per user.—*LF* 

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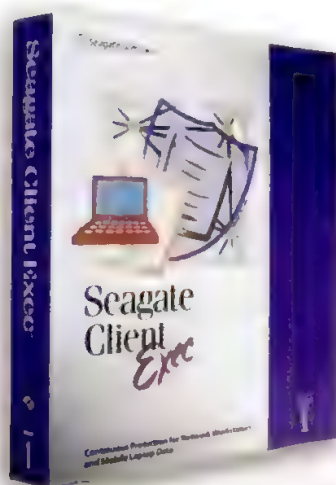
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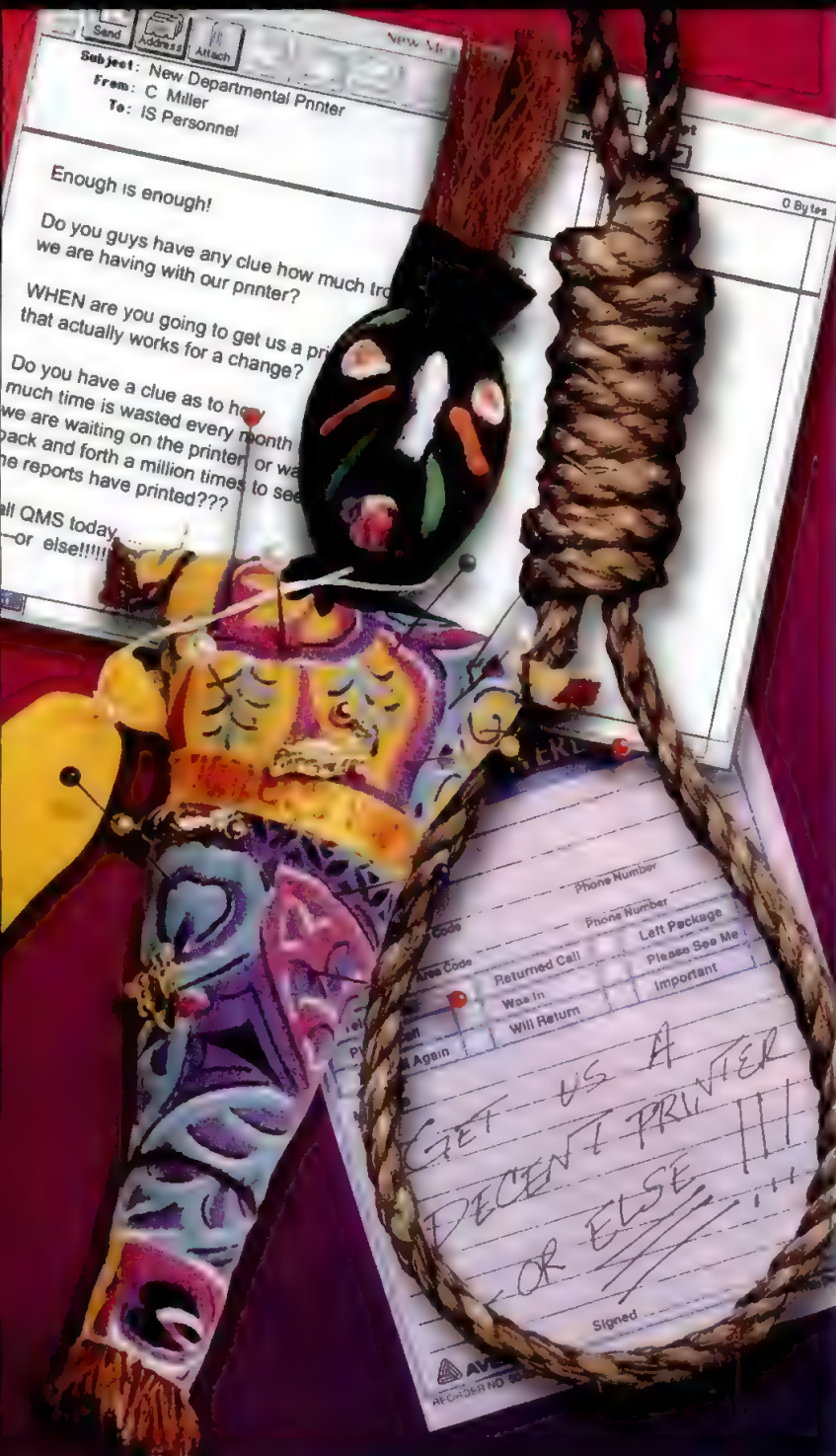
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TIPS, TRICKS, TOOLS, AND TECHNIQUES FOR YOU AND YOUR PC

SOLUTIONS

TUTOR

Inside Input Devices



The ways to work with your computer and to put information into it are many and various, but the old standbys remain with us.

By Neil Randall

The exciting part of computers is their output: screen displays, printed documents, and sounds. But the magic of computers is that we can put things in as well as get things out, and input devices are at the heart of this magic. The two most popular input devices, keyboards and mice, are simply taken for granted these days, but that doesn't make them any less important. They're part of the list of input hardware, which ranges from game controllers to scanners and beyond, and how they work very largely determines how we work. Here we give the most popular input devices their due.

KEYBOARDS

Despite the rise in importance of the mouse over the past 15 years, the keyboard remains the major input device for computers. All keyboards are designed to tell the BIOS, and ultimately the CPU, which keys you've pressed and in which order. To do so, the keyboard must be able both to detect your keystrokes and to make this detection useful.

Keyboards come in two main types: *contact* (or *switch*) and *capacitive*. The contact type is the older of the two. In this type, a mechanical switch closes with each keypress, completing an electrical circuit. A spring or similar mechanism forces the pressed key back to its original position, opening the circuit and thus breaking the contact. Capacitive keyboards eliminate the need for switch contacts, instead relying on a change in capacitance (stored energy charges) to read the keypress.

The mechanical, spring-loaded type of contact keyboard remains popular. Each key has its own plastic assembly with metal contacts. In these keyboards, pressing the key typically offers audible feedback in the form of a click, but two other types of contact keyboard work with rubber instead of springs and offer no audible feedback. A *rubber dome* keyboard has a sheet of synthetic rubber under the keys. Each key has a corresponding raised dome on the sheet. When you press the key, you depress the dome (this action gives tactile feedback), and a carbon contact touches a circuit board below the rubber sheet and makes the contact. Rubber dome designs are widely used in keyboards today, because they are reliable and use fewer parts than the pure mechanical type. *Membrane* keyboards are much like the rubber dome type, but the keys are no longer separate; instead, they're part of the rubber sheet itself. They are excellent for environments in which dust and dirt are a major factor (dirt gets into keyboards easily), but their design offers little tactile and no audible feedback.

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USER TO USER



Managing the *Start* menu's Documents list; preventing for-mattling loss in Word 97; cleaning up cookies in Internet Explorer; calculating dates for column headers in Excel; and more. *Page 223.*

UTILITIES



Windows automatically displays items in your *Programs* menu in alphabetical order—until you make a change. After that, automatic sorting is disabled. MenuZap will set things right again. *Page 236.*

INTERNET USER



Windows 98 and NT 4 come with several useful but unheralded Internet utilities. They may not be pretty, but they're the right tools for certain specific jobs. *Page 241.*

ENTERPRISE COMPUTING



The large and complex needs of a big organization call for specialized solutions in hardware, software, and administration. *Page 247.*

PC TECH



3Com's Palm system has earned a loyal following by putting a lot of functionality in a small package. And there's a wealth of software and support available. *Page 263.*



TUTOR

Capacitive keyboards do not use mechanical switches. Instead, they simulate switch actions by detecting changes in capacitance. Under each key are two plates; the upper, movable plate has a charge opposite to the lower, fixed plate's. The space between the two plates stores the energy resulting from the attraction between the charges. When a key is pressed, the plates come closer together, increasing the strength of the field between them and thus the capacity for storing energy. The circuitry in the keyboard detects this change and sends information telling the CPU that the key has been pressed. Capacitive keyboards are more reliable and durable than contact keyboards, but they are also more expensive.

Details about which keys have been pressed reach the BIOS as a series of *scan codes*. The switches (real or simulated) correspond to a grid called the *key matrix*. Inside the keyboard is a circuit board with a processor of its own. Whenever a key is pressed or released, this processor reads the corresponding location on the matrix and sends this information to the keyboard controller on the motherboard in the form of a data packet. This controller tells the BIOS that the scan code is available, and the BIOS stores this information in a keyboard buffer and translates the scan codes into ASCII for use by the CPU.

MICE AND OTHER POINTERS

The mouse was invented by Douglas Engelbart way back in the mid-'60s (Engelbart also developed the first hypertext system back then). With the release of the Macintosh in 1984, Apple brought it into the mainstream. It became popular in the PC world several years later with Windows 3.0, and it's been at the core of computer input ever since.

Mice come in one-, two-, and three-button configurations. Mac mice use one button, Unix mice usually use three, and PCs have standardized around two, with some vendors offering a customizable third button or scroll wheel. Depending on its construction, a mouse connects to the PC through a serial port, a bus card, a motherboard connector (the most common today), or a USB port. The mouse communicates with the computer through a driver, either loaded separately (as with DOS) or built into the operating

system. Windows installs using a standard mouse driver but replaces this driver with one specific to the actual mouse, either through plug-and-play or a separate driver installation.

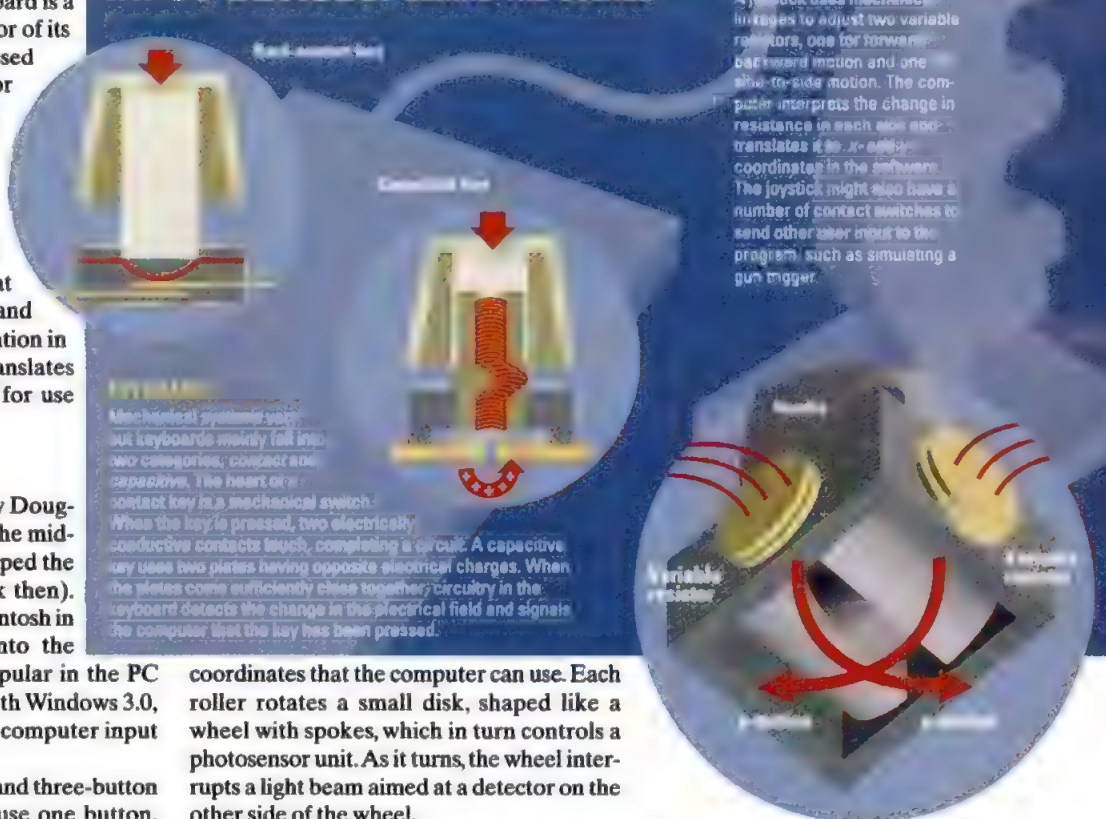
The vast majority of PC mice are *opto-mechanical*, though purely mechanical and purely optical mice exist. In the typical opto-mechanical mouse, a ball of rubber-coated steel sits against two perpendicular rollers. When you use the mouse, the ball rotates against these rollers, and the rollers begin the translation of the movements into x,y-

mation passed to the video system.

The optical mouse is distinguished from the opto-mechanical mouse by its use of a dedicated mouse pad. This mouse pad features a grid pattern, which the mouse uses to determine locations and movements. Instead of wheels, the mouse uses sensors to read the grid, then passes the information to the mouse driver. Obviously, with no moving parts, the optical mouse is less susceptible than mechanical mice to dirt or wear. But its design has never really caught on, because of the need for a special mouse pad. The Super Nintendo used an optical mouse for a drawing program, but optical mice have been rare in the PC world.

Trackballs are technologically very similar to mice. Basically, a trackball is

INPUT DEVICES: BEHIND THE SCENES



coordinates that the computer can use. Each roller rotates a small disk, shaped like a wheel with spokes, which in turn controls a photosensor unit. As it turns, the wheel interrupts a light beam aimed at a detector on the other side of the wheel.

By calculating the number and frequency of these interruptions, the mouse driver determines the direction, distance, and speed of the mouse movement. Through the mouse interface, the driver also receives information about which button was pressed and the coordinates at which that press took place. In addition, the driver handles the positioning of the mouse pointer on the screen by continually updating the location infor-

nothing more than a mouse in which the ball is on the top with the buttons, rather than on the bottom touching the mouse pad. The ball itself is usually larger than the ball in the bottom of a mouse, but only for the convenience of human operators, not because it has to be. Like mice, trackballs use the roller and sensor system, and the trackball driver processes distance, speed, and location information in the same fashion as a mouse driver.

Dirt is a problem with trackballs too. In fact, it's possibly an even greater problem, since the trackball is on the top of the device and therefore open to any dirt that can descend onto it. Naturally, engineers are working to correct this problem, and the results are beginning to show. Logitech, for example, has developed the TrackMan Marble, which uses optical technology to get rid of the dust-and-dirt problem. The ball of the mouse is a marble imprinted with hundreds of small dots. As the ball moves, a system consisting of light beams, a lens, and a mirror transfers data about a specific section of these dots to the device's sensor chip at a rate of 1,000 times per second. This data then moves through the port to the device driver, which calculates the coordinates. Gone are the rollers of the traditional trackball, but unlike the ball in an

ple, has appeared on keyboards and notebooks alike. Here, a colored rubber pointing stick that resembles a pencil eraser, and that rests in the space between the G, B, and H keys, interacts with pressure sensors beneath the keyboard to determine direction, distance, and amount of force. The touch pad—a small pad situated between the Spacebar and the front edge of the notebook—functions in much the same way as the capacitive keyboard, with the fingers rather than the keys providing the pressure needed to create the change in capacitance.

What's interesting about all the pointer variations is that none has even come close to up-setting the mouse in sheer popularity. Notebook users, in fact, often plug mice into their computers and ignore the built-in pointing technology completely, even when space is limited.

The most popular gaming device is the joystick (with its many variations). The stick part of the joystick controls two variable resistors, arranged to be perpendicular to one another. The values from these resistors, which typically range from 0 to 100,000 ohms, provide the *x,y*-coordinates. When you move the stick, you change the resistance values and thus the two-dimensional coordinates, and these values are sent as an analog signal to the game port. The game adapter then converts the values to a digital pulse, and the duration of this pulse is timed by the adapter's driver software to determine the joystick's position. The joystick's buttons are switches, which are usually open but which close when pressed. Exactly what the position and button information does depends on how the game is programmed to receive the signal.

Even if the joystick doesn't actually have a stick, the design principle is the same. In steering wheel devices for racing games or flight wheels for flight simulators, for example, the wheel controls the resistance just as the stick does in a standard joystick.

Newer joysticks offered by companies such as CH, Logitech, and ThrustMaster are purely digital devices. Instead of continually watching the game port for analog signals—consuming system resources—and then converting to digital pulses, the game adapter receives information about joystick positioning in digital form to begin with. The result is faster and more precise

joystick operation. USB joysticks, which have started to become available, will mostly be digital devices.

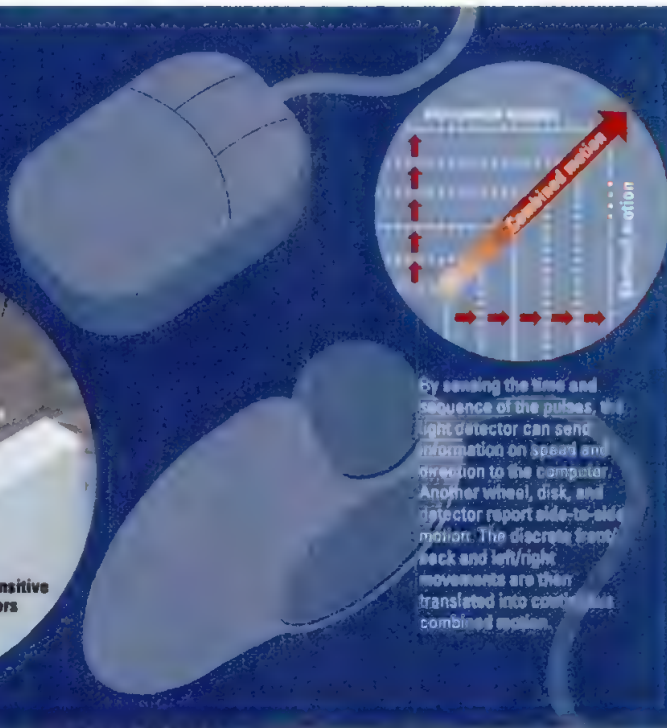
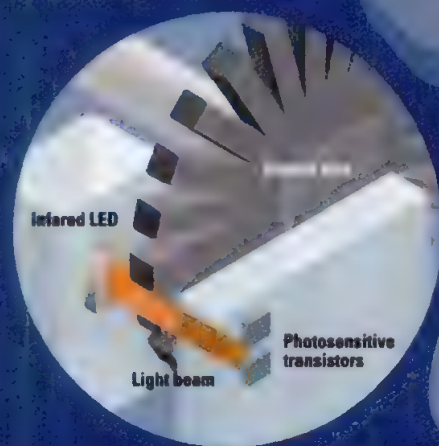
AND MORE

Keyboards, pointing devices, and game controllers represent the majority of PC input devices, but there are many more, including touch screens, scanners, golf simulators, cameras, microphones, and light pens. The purpose is generally the same, however: to render human actions—typing, steering, selecting—as data the computer can understand. **PC**

Neil Randall is a contributing editor of PC Magazine.

MOUSE AND TRACKBALL

Most mice and trackballs work on the same principles. When a ball is moved forward or back, it turns a small wheel. This wheel is attached by a shaft to a wheel disk, like a bicycle wheel with thick spokes. As the disk turns, it breaks a beam of light between an infrared LED and a light detector with two sensors.



optical mouse, the ball itself continues as the primary interface.

The main difference between mice and trackballs lies in their uses and their possible implementations. Users who become adept at positioning the mouse pointer by rolling the ball with their fingers typically find the trackball a more usable device, and certainly one that takes up less desk space. Trackballs have also been built right into keyboards and notebooks; that makes sense, because only the ball, not the entire assembly, moves.

Notebook computers (and some desktop keyboards) offer other pointing systems as well. IBM's TrackPoint technology, for exam-

GAMING DEVICES

When IBM neglected (or refused) to make the game adapter a standard feature of the PC, XT, and AT, it set computer gaming back a long way. The gaming port was standard in the Commodore 64, released about the same time as the IBM-PC and the most popular computer of its time. But like color graphics and useful sound, joysticks and game pads had no place in IBM's business-oriented world, so the game adapter became the province of third-party vendors, including sound card makers such as Creative Labs. The PC 98 specifications demand game adapters on all Entertainment PCs, so in all likelihood they'll become standard very shortly.

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CPU	RAM std./max.	Hard drive std./max.	Price	CDW
350MHz Pentium II	64MB/384MB	none/27GB	\$1378.90	136816
350MHz Pentium II	64MB/384MB	4 3GB/27GB	\$1777.50	136536
400MHz Pentium II	64MB/384MB	none/27GB	\$1721.81	136539
400MHz Pentium II	64MB/384MB	4 3GB/27GB	\$2118.41	136542



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USER TO USER

Manage Start Menu's Documents List

The Documents list on the Start menu is handy, but it can quickly get cluttered with useless documents. Luckily, there is an easy way to remove unwanted documents: just right-click on an item and select Delete. This is a quick solution for weeding out documents you don't frequently access, or for keeping the files you've been working on private.

Michael Momaney
Putney, Vermont

PC The Documents list displays files you've recently opened, so you can easily open them again. Once the list is full, each new item pushes the oldest item off the list. Documents here doesn't just mean letters and memos, either—in this context, a document can be any file type that's registered with the system. The problem is that files you've deleted or renamed can remain pointlessly on the list for a long, long time, as can files that you won't need to open again soon. Not only that, any snoop with access to your office can peek at the Documents list and see exactly what you've been working on (Figure 1). Use this tip to remove anything from your Documents list that shouldn't be there.

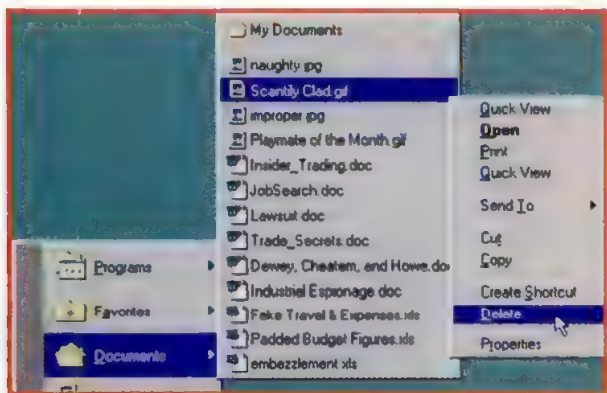


FIGURE 1: With Active Desktop installed, you can right-click unwanted items in the Documents list and remove them easily.

This technique requires Active Desktop, which is installed as part of Microsoft Windows 98. You can use it under Windows 95 or Windows NT 4 too, as long as you've installed Internet Explorer 4. Under Active Desktop, you can manipulate the whole Start menu in a variety of ways, without having to open it in Windows Explorer. You can move an item in the Programs menu or any of its submenus just by dragging it to the desired location. Right-drag an item from the Start menu to the desktop to either move it from the Start menu or make a copy on the desktop. As noted, you can delete items by selecting Delete from the menu that pops up when you right click. To find out exactly what command a menu item launches, right click it and choose Properties. Active Desktop lets you tweak the Start menu to your heart's content!—Neil J. Rubenking

Windows Start-Up Mystery Solved!

This is in response to the item "Managing Windows Start-Up" in the User-to-User column of May 5, 1998 (www.zdnet.com/pcmag/pctech/content/solutions/uu1708a.htm). In addition to the somewhat sneaky method of putting a program in HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\

Windows\CurrentVersion\Run, in RunServices, or in Win.ini, there's an even sneakier method used by some installation programs. Programs named in values under the key HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run will also run at start-up. It took me quite a while to figure out where Netscape 4 had planted AOL Instant Messenger!

David Wallenstein
Brooklyn, New York

PC As noted in the earlier article, many programs and utilities install themselves to run automatically when your computer starts. If you want to prevent such a program from running at start-up, you must first find the command that launches it. The command may be in the StartUp submenu under Programs in the Start menu. In that case, preventing it from launching is as simple as moving it to a different submenu. If it's found in the Load= or Run= line of Win.ini, you can comment out the line by prefixing a semicolon. And if it appears in the list of values for the Run or RunServices keys mentioned above, you can disable its launching by editing the value data and prefixing REM to the command. You should always disable these start-up commands rather than deleting them, on the chance that you'll need to restore them.

A number of readers wrote in to say that they'd checked all three areas, found nothing, but still had unwanted programs running at start-up. This tip solves that little mystery. Run RegEdit, navigate to HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run, and examine the right-hand pane of RegEdit's display. Each named value defines a program that will run at start-up; the data for the value contains the command line. As before, to prevent such a program from running, prefix its data string with REM rather than deleting it. This key is functional in Windows 95, Windows 98 beta, Windows NT 4, and Windows NT 5 beta. —Neil J. Rubenking

Boot Blunder?

I just added some memory to my computer system, and now it won't boot from the hard disk. Even when I boot from a floppy, I still cannot access anything on the hard disk. Did I miss a step where I should have changed a configuration setting to recognize the new memory?

John Odekirk
via the Internet

PC The chances are excellent that the problem has nothing to do with your added memory. Instead, you probably just loosened the cable connection for the hard disk while you were poking around inside the computer.

Given the cramped quarters found inside most computer cases these days, it's not hard to tug a cable or budge a connector inadvertently. Given the heating and cooling cycles that these machines go through, they can also become loose on their own. As a result, whenever you're working under the hood, it's a

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good idea to go around and reseal all the cables and cards to make sure that they have clean and solid connections.

In fact, when working in close quarters, it can be a good idea to remove the cables and cards that are in the way before you start. If you have any doubts about which pieces go where, use sticky notes or small labels to mark the different parts, or use a Polaroid or digital camera to take pictures of the components so you can see where they all go. Moving the cables and cards will give you a more open space within which to work, and you'll be sure to reseal them firmly when you put them back in place when you're finished.

—Alfred Poor

Word 97 Files Seem to Lose Formatting

I've been using Microsoft Word 97 and Works 4.5 for some time without problems. Just recently, though, I've been having a problem every time I open an existing document with Word in either format. When I open a Works file, instead of seeing the formatted document, I first see a header that looks like this:

```
Root Entry
MatOST
MatOST
```

This is followed by the text of the document, with extra paragraph returns, but without such formatting enhancements as bold or italics. Finally, I get a trailer that looks like this:

```
oa[[UUUUUUUUUUUU
Times New Roman
Garamond
Microsoft Works
```

and so on.

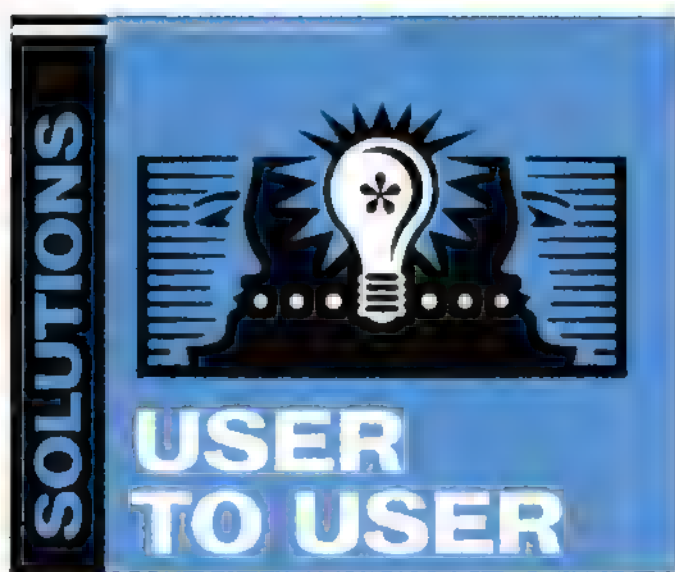
When I open a Word file, I see similar results. There is no header, but the text loses its formatting, and I get a trailer that looks like this:

```
Normal
Normal
Default Paragraph Font
Default Paragraph Font
```

and so on.

This problem started the day after a more novice user than I used Word. Is there something she may have done to trigger the problem? And is there anything I can do to prevent this in the future?

David Shareno
Orchard Park, New York



PC Judging by my e-mail, this is one of the most common problems Word 97 users run into when they first start using files with extensions other than Word's default DOC. The solution is almost as easy as toggling Caps Lock off when you find yourself typing in all uppercase, but it's surprisingly easy to overlook.

Choose *File | Open* to go to the *Open* dialog box and browse through the choices for *Files of type*. One of the choices you'll find is *Recover Text from Any File (*.*)*. It's easy to misread this as being equivalent to the *All Files (*.*)* choice. And, indeed, if you open a file with nothing but text—no program-specific file formatting or program-specific headers or footers—it will seem to behave the same way. Choose it and the dialog box will show a list of all files. Open a text file and you won't see anything unusual.

Open a file that follows a program-specific format however, and you will see a difference. With the *All Files* choice, Word will make the effort to identify the file format and translate it. With the *Recover Text from Any File* choice, Word will treat formatting information like text, and simply open the file. In this particular case, it's showing the headers and footers that Works and Word use to keep track of formatting and other information, such as document properties.

Once you've used the *Recover Text from Any File* choice, Word remembers it until you change it. So all you have to do to fall into this trap is use this option to open, say, a text file, edit it, save it, and close Word without changing the *Files of type* choice back to something else.

The fix is simple enough: Close the file, change the *Files of type* choice to *All Files (*.*)* or *Word Documents (*.doc)*, and open the file again. But you probably won't figure this out unless you're aware of the *Files of type* choice in the first place, and know what a Word file looks like when you open it using this option. If you've never done this accidentally, it's worth doing once on purpose, so you can see what the file looks like. Just be sure to close the file without saving it, or you'll lose all your formatting.

Note too that the *Recover Text from Any File (*.*)* option is there for good reason, though it would probably be better named, *Emergency Recovery of Text from Files that You Can't Open Any Other Way*. Should you

wind up with a corrupted DOC file that Word can't open, or a file in a format that Word can't read, this choice will let you open the file so you don't have to retype the text. Use it as a last resort, however, because you will lose all formatting in the process. It's also a good idea to make a copy of the file first and work with the copy. That way, you'll still have the original, should you need to go back to it.
—M. David Stone

Cleaning Up Cookies In Internet Explorer

There's a Microsoft Windows 98 VBScript program that can help you manage Internet Explorer cookies (shown in Figure 2). The script displays the filenames of any new cookies, along with the originating Web site, and asks the user to classify each new cookie as either good or bad. Bad cookies are deleted immediately; good cookies are copied to a Save directory for future reference. If a good cookie expires and is deleted by the browser, the script will delete the corresponding copy from the Save directory as well. With this script, you can browse with confidence, knowing that the "cookie crumb" litter deposited on your hard drive by so many Web sites can be easily cleaned up.

Ernie Deel
via the Internet

PC You can download Cookies.vbs from www.pcmag.com. To run the script, you need the Windows Scripting Host, which is optionally installed as part of Windows 98. If you're running Windows 95 or Windows NT 4, you can still take advantage of the WSH; you'll just have to download and install it. Navigate to msdn.microsoft.com/scripting/default.htm?/scripting/windowshost, click the download link, and follow the instructions. If, as often happens, the Web address for this information has changed by the time you read this article, go to www.microsoft.com and search on the phrase "Windows Scripting Host."

The first time you use the Cookies.vbs script, it presents you with every existing cookie on your system, one after another, and asks whether the cookie is good or bad. That can take a while; my main system had nearly 200 cookies! To ease the pain of that first time, I added a *Cancel* button, so you can stop the process and start again later. You may also find the *Cancel* button handy when the Web domain displayed for a particular cookie doesn't look familiar—you can stop the script, revisit the domain,

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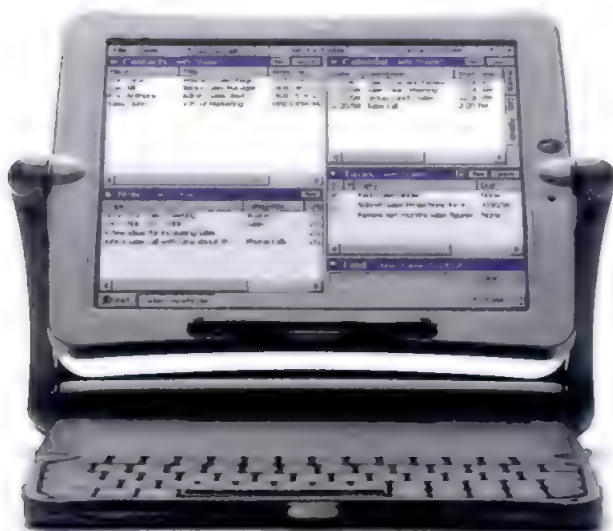
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 - Microsoft Pocket Excel
 - Microsoft Pocket PowerPoint
 - Microsoft Pocket Access
- > Microsoft Pocket Internet Explorer
- > ParaGraph CalliGrapher® handwriting recognition
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USER
TO USER

```
' Simple Cookie Manager Script
.
' Manage any "unclassified" browser
cookies. "Good" cookies are
' copied to a Save folder, "bad" ones
are deleted. If/when a
' "good" cookie expires and is deleted by the browser,
the Save
' copy is deleted as well.
.
' Cookie path = \Windows\Cookies
' Save path  = \Windows\Cookies\Save
Option Explicit
Dim fso, CFold, SFold, Cookies, fc, fs, fn, domain
Dim WindowsFolder, cntc, cntd, cnte, cnc1
WindowsFolder = 0
Set fso =
WScript.CreateObject("Scripting.FileSystemObject")
CFold = fso.GetSpecialFolder(WindowsFolder)
CFold = CFold & "\Cookies"
SFold = CFold & "\Save"
if Not fso.FolderExists(CFold) then WScript.Quit
if Not fso.FolderExists(SFold) then
fso.CreateFolder(SFold)
Set fc = fso.GetFolder(CFold)
Set Cookies = fc.files
cntd = 0
cntc = 0
cnte = 0
cnc1 = 0
On Error Resume Next
MsgBox "This script will display each Internet Explorer "
&_
"cookie found on your system and ask whether " &_
"it is a " & chr(34) & "good" chr (34) & " cookie. " &_
"If you answer yes, it will make a copy " &_
"of the cookie as a reminder not to ask again. If you "
&_
"answer no, it will delete the cookie. You can cancel "
&_
"the process at any time and resume later." & chr(13)
&_
chr(10) & chr(13) & chr(10) & "The first time you run "
&_
"this script, it may take quite a while. After that, "
&_
"you should run it every few days." &_
vbOKOnly + vbInformation, "Cookie Manager Script"
'-- Delete/Copy new cookies
For each fs in Cookies
Dim BoxResult 'njr
fn = SFold & "\" & fs.name
if Not fso.FileExists(fn) then 'cookie not yet
classified
Set f = fs.OpenAsTextStream(1,0)
f.ReadLine
f.ReadLine
```

```
domain = f.ReadLine ' third line
is domain
f.Close
BoxResult = MsgBox(fs.name & "
from www." & domain &_
```

```
". Last Modified: " & fs.DateLastModified, _
vbYesNoCancel + vbInformation, _
"Is this a 'good' cookie ?" )
```

```
Select Case BoxResult
```

```
Case vbYes
fs.Copy fn,True
cntc = cntc + 1
```

```
Case vbNo
cntd = cntd + 1
fs.Delete
```

```
Case Else
cnc1 = 1
Exit For
```

```
end Select
```

```
end if
```

```
next
```

```
'-- Remove any "old" expired cookies
```

```
Set fc = fso.GetFolder(SFold)
```

```
Set Cookies = fc.files
```

```
For each fs in Cookies
```

```
fn = CFold & "\" & fs.name
```

```
if Not fso.FileExists(fn) then
```

```
cnte = cnte + 1
```

```
fs.Delete
```

```
end if
```

```
next
```

```
'-- Display action summary
```

```
if (cntc=0) AND (cntd=0) AND (cnte=0) then
```

```
if cnc1=0 then
```

```
WScript.Echo("No new or expired cookies found.")
```

```
else
```

```
WScript.Echo("No new or expired cookies found before
```

```
"&
```

```
"processing was cancelled by user.")
```

```
end if
```

```
else
```

```
if cnc1=0 then
```

```
WScript.Echo(cntd & " bad cookies deleted, " & cntc
```

```
&_
```

```
" good cookies copied, " & cnte & " expired cookie
```

```
"&
```

```
"copies deleted.")
```

```
else
```

```
WScript.Echo(cntd & " bad cookies deleted, " & cntc
```

```
&_
```

```
" good cookies copied, " & cnte & " expired cookie
```

```
"&
```

```
"copies deleted before processing was cancelled by
```

```
user.")
```

```
end if
```

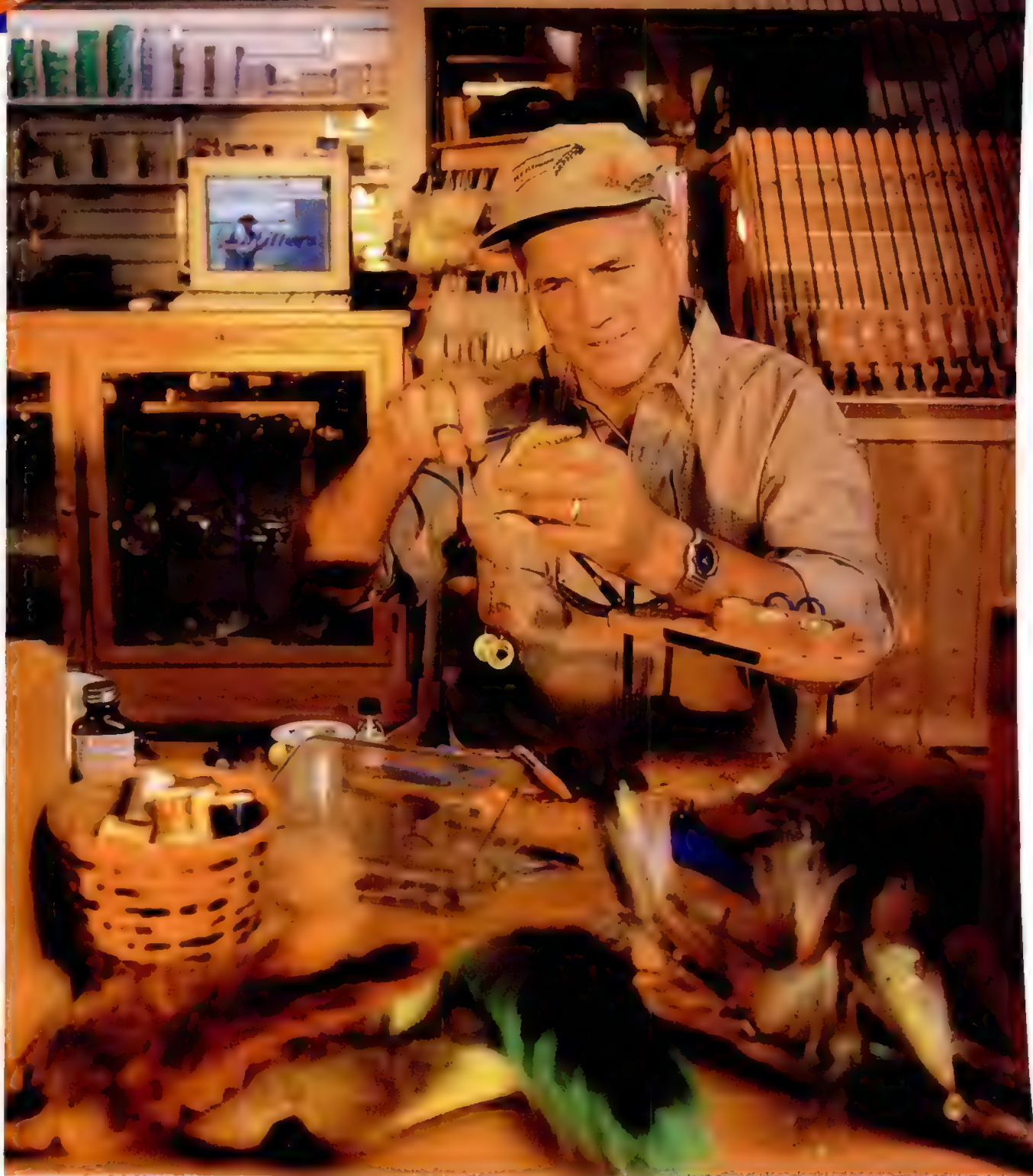
```
end if
```



FIGURE 2: Run this script every few days to keep your system free of Internet Explorer cookie clutter.

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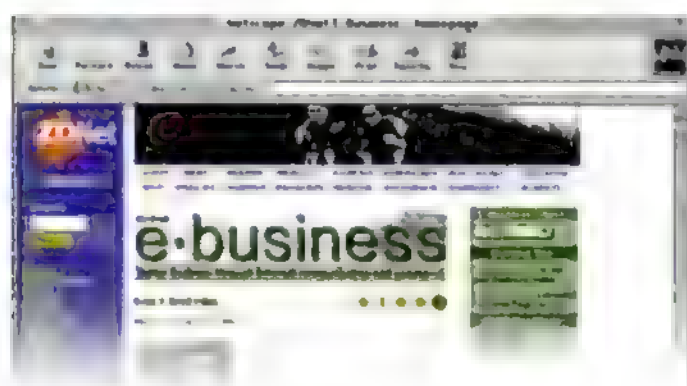
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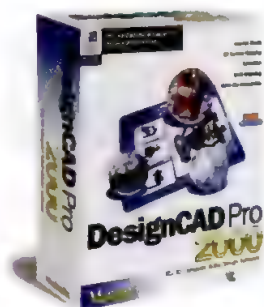
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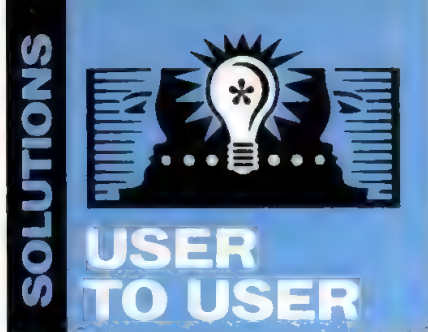
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and then run the script again.

You won't be duplicating your efforts when you restart the script after pressing *Cancel*. Every cookie you already processed has either been deleted or copied to the Save directory, and if a copy appears in the Save directory the script won't ask about that cookie again. I modified the final report to note when the user canceled the processing, and I added an initial message box explaining the script's purpose.

As you can see, there's a lot of power in VBScript and its built-in file and folder objects. In addition, VBScript can drive Automation objects that interface with other programs such as Microsoft Word, Excel, and Outlook. The WSH can run scripts written in either VBScript or JScript—it's the ultra-modern equivalent of the old DOS batch file processor. If your system doesn't have WSH installed, get it today!—Neil J. Rubenking

Calculating Dates for Column Headers

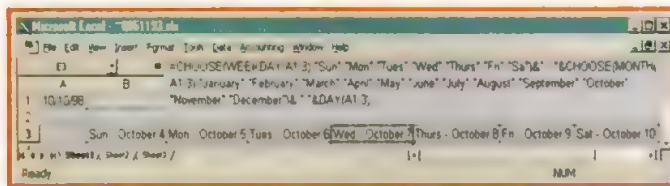
We use an Excel 97 spreadsheet to track our weekly time and expenses for billing. At the top of the schedule, there is a field to input the last day of the week for which an employee is submitting a time sheet. Within the schedule itself, there is a separate column for each day (Sunday, Monday, Tuesday, and so on). Is there a formula or other function that will allow us to input the date in the week-ending field and have that date somehow drive what is shown in the header of each of the daily columns? What we are looking for is for the days to be viewed as "Mon., July 6," "Tues., July 7," and so on, but we want to use only the week-ending field.

Jeff Williams
Orlando, Florida

PC You can use the `CHOOSE` function in conjunction with `WEEKDAY`, `MONTH`, and `DAY` to get the result you want. For example, if your end-of-week entry is a Saturday and you have it stored in A1, then the following formula would give you the appropriate text string for the first day of the week (Sunday), which is six days prior to the end of the week:

```
=CHOOSE(WEEKDAY(A1-6), "Sun", "Mon",  
"Tues", "Wed", "Thurs", "Fri", "Sat") &  
" - " & CHOOSE(MONTH(A1-6), "January",  
"February", "March", "April", "May",
```

FIGURE 3: When you enter a date into cell A1, the formulas in B3:H3 generate column headings for the seven days preceding that date.



```
"June", "July", "August", "September",  
"October", "November", "December") & "  
& DAY(A1-6)
```

For the second day of the week, Monday, you would reenter the formula but change all the A1-6 expressions to A1-5; for Tuesday, change them to A1-4; and so on. Figure 3 shows the setup of this worksheet.—Craig Stinson

Printing the Current Record in Access

I would like to have a button on my form in MS Access that would print only the current record to a report that I have already created. The online help in Access offers a solution using VBA, but I've been unable to get it to work. I was also wondering if this task might be accomplished more efficiently with a macro.

Doug Seidler
Orlando, Florida

PC To print the current record using VBA, you insert code like that shown in Figure 4 in the On Click event procedure for your command button. The code invokes the

```
Private Sub PrintReport_Click()  
On Error GoTo Err_PrintReport_Click  
  
DoCmd.OpenReport "Customers", acViewNormal, ,  
"CustomerId=Forms!Customers!CustomerId"  
  
Exit_PrintReport_Click:  
Exit Sub  
  
Err_PrintReport_Click:  
MsgBox Err.Description  
Resume Exit_PrintReport_Click  
End Sub
```

FIGURE 4: The command button's On Click event procedure prints the Customers report for the Customer ID currently shown on the Customer form.

`DoCmd.OpenReport` method to run the report and passes it three pieces of information. First is the name of the report ("Customers" for the example). Second is a constant that tells Access the report view you want. The default, `acViewNormal`, sends the report to the printer (see the `OpenReport` method in the MS Access help for the other choices).

Third is the SQL Where condition, used to restrict the records for the report. The code

```
"CustomerId=Forms!Customers!CustomerId"
```

shown in the example tells Access to include only records where the value in the `CustomerId` field is the same as the value currently shown in the `CustomerId` control in the Customers form of the Forms collection. This is how you get only the current record on the report.

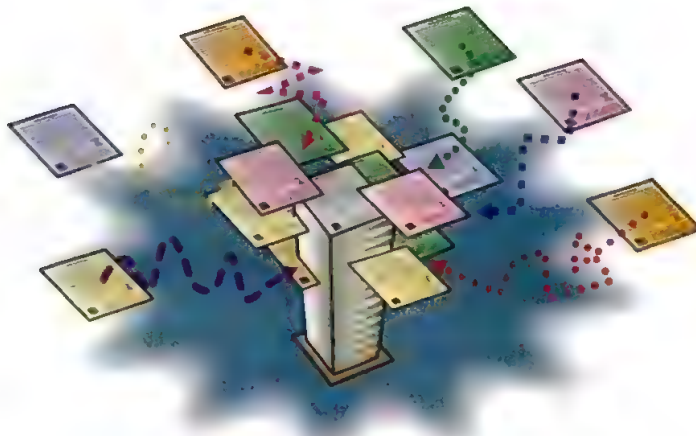
Figure 4 assumes that you're viewing a form named Customers and that you want to print a report, also named Customers, for the current record. To create a command button on your own form, open it in design view, then choose the *Command button* tool in the toolbox. Next, click and drag to draw the button on your form. When the Command Button Wizard appears, choose *Cancel*. Next, make sure the command button is selected (it should already be), then select the *View* menu and choose *Properties*. Select the *Other* tab in the *Properties* window, then click in the *Name* property and change the name to `PrintReport`. Next, select the *Events* tab in the *Properties* window and click in the *On Click* property. Then choose *Build* (click on the ellipsis—the three dots). When the *Choose Builder* dialog appears, select *Code Builder* and choose *OK*.

At this point edit the event code so that it matches the code in Figure 4. You'll want to change "Customers" carefully to the name of your own report, and change the SQL Where condition to one that's appropriate for your form. Usually you'll want to match the primary key field of your table to the matching field in your form.

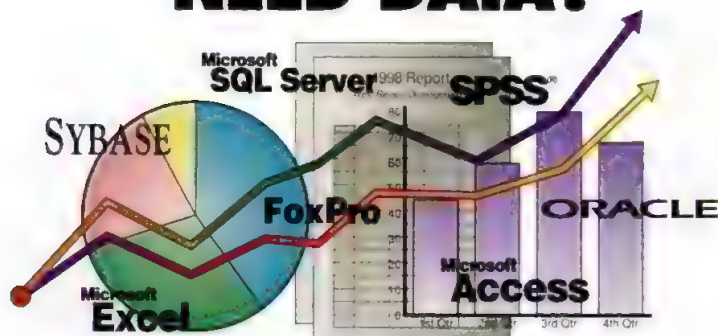
There's no advantage to doing this using a macro instead of VBA. If, however, you wanted to try the macro approach, you would create a macro that invoked the `OpenReport` action with the appropriate arguments (Report Name, View, and Where condition), save it under a unique name, and then attach that macro to the command button's On Click event.

—Sal Ricciardi **PC**

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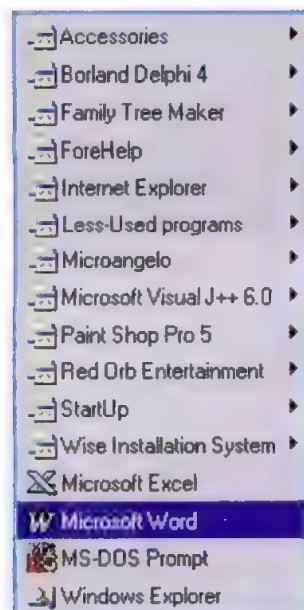
Zap Your *Programs* Menu into Order

The Windows desktop update that comes with Microsoft Internet Explorer 4.0 for Windows 95 or NT 4, and as part of Windows 98 and NT 5.0, adds the ability to use drag-and-drop to rearrange the *Programs* submenu of your Windows *Start* menu. But this feature has a downside. If you never change the order (or if you do not have the desktop update), Windows automatically displays the *Programs* menu in alphabetical order, with submenu items followed by nonmenu items. Once you have made any change to the order, Windows will no longer provide this automatic sorting; there

is no way to turn it back on. This issue's utility, MenuZap, provides a way to zap the *Programs* menu back into order.

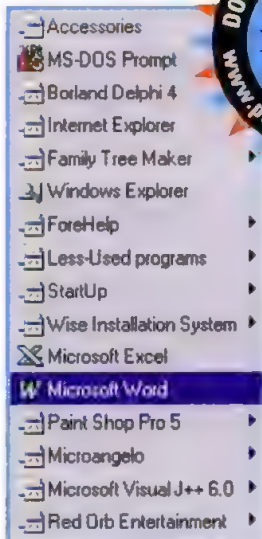
An article about how to use MenuZap and how it was written is available on our Web site at www.pcmag.com/pctech/index.html. A link to download the utility and its source code can also be found here.

Neil J. Rubenking, author of MenuZap, is contributing technical editor of PC Magazine. Sheryl Canter is editor of the Utilities column and a contributing editor of PC Magazine.

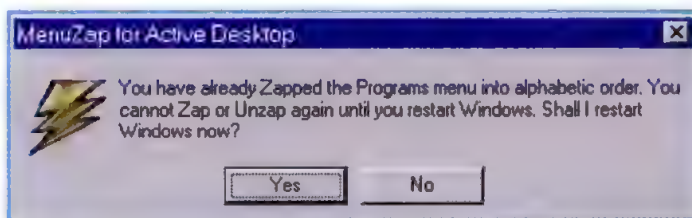


If you have never rearranged the items in your *Programs* menu, Windows automatically displays the items alphabetically, with submenu items followed by nonmenu items. Each submenu also is displayed in this way.

If you rearrange the items in the *Programs* submenu of your *Start* menu, Windows will stop automatically ordering the items for you. Newly installed programs will appear at the bottom of the list instead of in alphabetical order.



If your *Programs* menu has gotten too jumbled for comfort, launch MenuZap and click Zap. This will restore the menu to the default order. Click UnZap to undo the sorting.



MenuZap's changes do not take effect until Windows is restarted, so MenuZap offers to restart Windows for you. You can choose to restart Windows later, but you cannot choose Zap or UnZap again until Windows is restarted.

How to Get the Files: PC Magazine utilities and other Solutions files are available on the Internet, on CompuServe, and by mail.

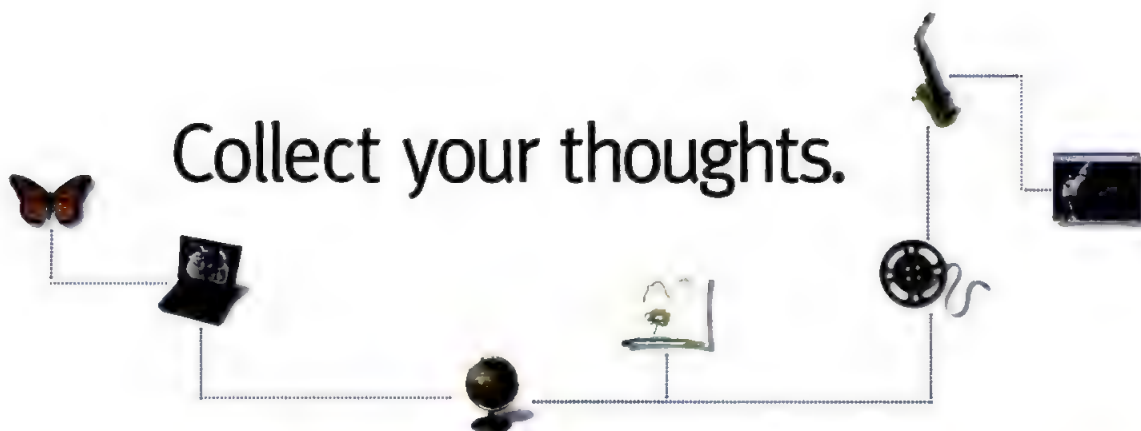
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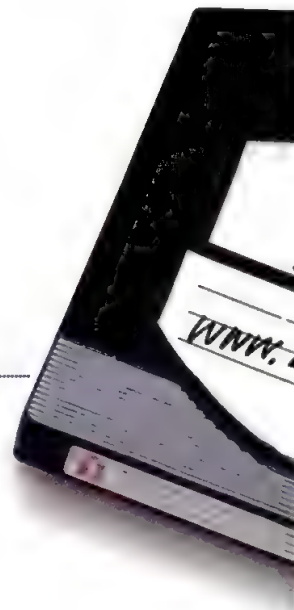
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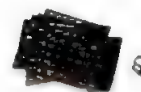
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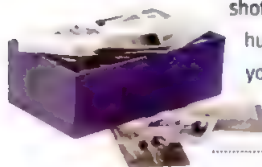
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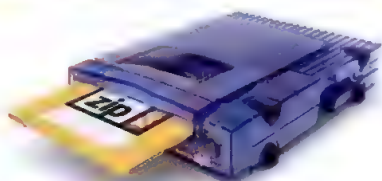
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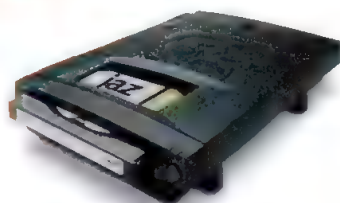


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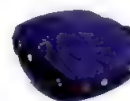
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INTERNET USER

Internet Apps in Win 98/NT 4

By Neil Randall

Anyone running Windows 98 or NT 4 knows that the operating system ships with three important pieces of Internet software: a World Wide Web client (Internet Explorer), an e-mail client (Outlook Express), and a Web server. Internet Explorer (IE) functions primarily as a client for HTTP (HyperText Transfer Protocol), the basic protocol for the World Wide Web. Outlook Express (OE), on the other hand, operates mostly as a client for the three primary Internet mail protocols: POP (Post Office Protocol), IMAP (Internet Message Access Protocol), and SMTP (Simple Mail Transfer Protocol). Windows 98 ships with Microsoft Personal Web Server, while Windows NT 4 Workstation includes Peer Web Services and Windows NT 4 Server comes with Internet Information Server. These servers are HTTP daemons, and they allow Web clients to retrieve data.

In fact, IE and OE go beyond their intended major protocols. OE operates as a news reader and therefore handles NNTP (Network News Transfer Protocol). IE handles the secure Web protocol, HTTPS, as well as FTP (File Transfer Protocol) and the early browsing protocol Gopher. Given that e-mail and the Web are the two major Internet activities and that FTP remains a download protocol of choice for many sites, IE and OE take the brunt of most users' work. The three servers, meanwhile, operate not only as Web servers but also as FTP servers (Gopher service disappeared from IIS with the release of Version 4.0).

But the Internet is filled with protocols and associated programs, and the IE/OE combination can't handle all of them. In fact, Windows itself can't handle all of them (no matter which version you use, including the upcoming Windows NT 5.0 Server and Workstation). Still, beneath the glossy sheen of Windows lies another set of Internet tools, most of them command line programs. You can run one either by opening an MS-DOS command prompt or by selecting *Start | Run* and typing in the program's name. The programs themselves are found in your Windows directory; all are EXE files.

For the most part these programs made it to Windows by way of Unix, where they be-

came popular as Unix, with its client/server model, became the primary operating system of Internet users during the '80s and early '90s (before Apple and Microsoft took notice). The protocols themselves aren't Unix-specific, but a great deal of both client and server software was developed on Unix systems because of their growing popularity during these years, and the Windows versions are Unix-like in their operations and interfaces.

Note: Like the term *Unix* itself, the names of the Internet protocols and applications get

have added options to telnet. These cover tab stops and other keyboarding concerns, terminal emulations and negotiation, and much more. Telnet applications give this protocol a character-based interface, and all versions of Windows more recent than 3.x include Telnet.exe, a limited but useful telnet client.

The telnet program found in Windows is a basic version of telnet (see Figure 1), with options limited to local echo, cursor type, arrow key usage, and the size of the line buffer (how many lines you want to buffer into memory). In addition, you can select a display font and a background color, but these are Windows options rather than telnet options. As for terminal emulations, Telnet.exe offers only two, the industry standards VT-52 and VT-100. IBM 3270 is just one popular terminal type that the application does not handle at all. A wide variety of freeware and shareware telnet applications are available for Windows users who need more, but for many, Telnet.exe will be enough.

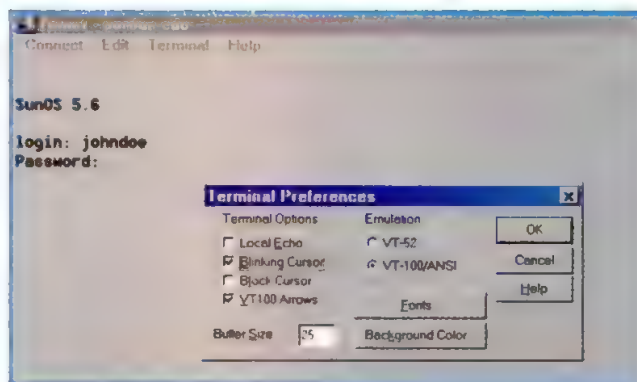


FIGURE 1: The Preferences window of Telnet.exe lets you select a limited number of options. The background shows the start of a log-on to a remote server.

capitalized in various ways. *Unix* is often written *UNIX*, while the officially named *gopher* is usually written *Gopher*. *Telnet* is *TELNET* in the original Request for Comments (RFC), the accepted form of documentation for Internet standards; frequently *telnet* in Unix documentation; and usually *Telnet* in computer books.

TELNET (TELNET.EXE)

The telnet protocol is explained in RFC 854. The authors of the RFC describe its primary goal as allowing "a standard method of interfacing terminal devices and terminal-oriented processes to each other," and telnet has always been used for remote terminal access. Using telnet typically means connecting to the remote server, logging on with a user name and password, and typing commands for a variety of functions (directory lists, program launch, and so on). A number of RFCs following 854

FTP: FILE TRANSFER PROTOCOL (FTP.EXE)

File Transfer Protocol (FTP) is probably the unsung hero of the Internet. Defined in one of the earliest RFCs (172), FTP has operated as the standard protocol for file transfers since very near the Net's beginnings, and it remains just as important today. Many Web sites offer FTP links for file downloads, and while HTTP can also be used for this purpose, FTP is often

considerably faster. FTP allows users to upload and download text and binary files, and its options include the listing of directories, the deletion of remote files, and transfer of multiple files. It also allows you to download part of a file and resume downloading the rest later—a feature not supported by HTTP.

FTP access is controlled by user names and passwords. If you want to access your own remote account on a Unix server, for instance, you'll need to specify your log-on information. But the power of the protocol during the Internet's development has been in a special access mode called *anonymous FTP*. By specifying the user name *anonymous* and using a generic password (typically either *guest* or, preferably, a valid e-mail address), you can access directories that the operators of a remote server have set aside specifically for publicly available files, usually in a directory named *Pub*. Even today, if you connect to



ftp.netscape.com, for instance, you can download the latest version of Netscape Communicator (Figure 2).

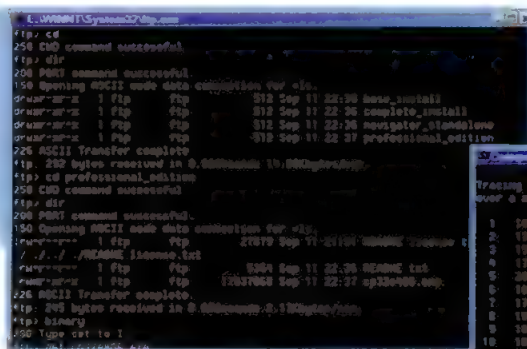
The Windows FTP client (*Ftp.exe*) is essentially a DOS version of the standard Unix FTP client. Its command line interface features the same commands as its Unix counterpart, to the degree that anyone familiar with the Unix version will feel instantly at home in this one. The problem is that Windows users today are rarely comfortable with DOS, let alone Unix, and even for Unix applications FTP isn't exactly intuitive. As a result, a *huge* number of freeware and shareware FTP utilities have been developed for Windows users, all of which emphasize a more visually intuitive interface; some, indeed, go so far as to make FTP part of Windows Explorer. By using the *ftp://* prefix for a URL, you can also access FTP sites through your Web browser, but options are far more limited.

To get a list of commands to use once an FTP connection has been established, type *help* at the FTP prompt.

PACKET INTERNET GROPER (PING.EXE)

The word *ping* is derived both from the phrase in the heading above and from a term for sonar searching, which offers positive feedback through a "ping" sound. The idea,

FIGURE 2: Here, Windows' FTP client has entered the Professional_ edition subdirectory to download Netscape Communicator 4.06, designated by filename *Cp32e406.exe*. The binary command sets the client to receive a binary file, and the get command starts the download.



though, is that pinging means making contact.

The ping tool has one simple purpose: to let you know whether a remote machine is accessible. It fulfills this function by transmitting a single packet to a specified IP address, either numerically (165.232.5.3) or by domain name (*microsoft.com*). It works by making use of the echo request of Internet Control Message Protocol; ICMP is designed to troubleshoot and debug networking errors.

Like its FTP client, Windows' *Ping.exe* is a Unix-like implementation. The best way to access it is through the MS-DOS prompt (the command prompt in Windows NT), because if you launch it directly from *Start | Run*, the ping window will shut down before you have time to read the information. From the DOS prompt, type *ping* followed by either a machine name (*whitehouse.gov*) or an IP number (198.137.241.30) and *Ping.exe* will send

four packets to the remote machine and return the responses, one by one.

A typical result is as follows:

```
Pinging whitehouse.gov
[198.137.241.30] with 32 bytes of
data:
    Reply from 198.137.241.30: bytes=32
    time=180ms TTL=245
    Reply from 198.137.241.30: bytes=32
    time=181ms TTL=245
    Reply from 198.137.241.30: bytes=32
    time=200ms TTL=245
    Reply from 198.137.241.30: bytes=32
    time=171ms TTL=245
Ping statistics for 198.137.241.30:
    Packets: Sent = 4, Received = 4,
    Lost = 0 (0% loss),
    Approximate round trip times in
    milli-seconds:
        Minimum = 171ms, Maximum =
        200ms, Average = 183ms
```

This result tells you that the remote ma-

chine received all four packets; if not, the result would have told you that the host was unreachable or the request timed out. The size of each packet is also displayed. For gauging connection speed, the most important statistic is the *time*, which measures the round trip in milliseconds. Here, the times range from the fastest at 171 ms to the slowest at 200 ms; these times are fairly consistent. *TTL* means *time to live*, a term that tells you how many hops (intermediate connections along the data path) the packet can travel before it will be returned as undeliverable or dropped entirely. You can change the default of 255 through a command line option. *TTL* was built into TCP/IP to ensure that undeliver-

able packets wouldn't bounce around the Internet indefinitely.

The ping stats are summarized at the bottom of the result message (except in Windows 95 and earlier). For a list of options, type *ping -h* at the command prompt.

FINGER (FINGER.EXE)

Finger is similar to ping in that it returns information about a specifically targeted item. In finger's case, however, the item is an Internet user rather than an Internet machine. Like *ping*, the name comes from real-world use (but do be careful how you use the term in social settings): You're essentially tapping someone on the shoulder to see whether the person responds. Also like *ping*, Windows' version of finger is best accessed through the command prompt so that the information remains visible. The finger utility is available only on Windows NT platforms. Simply type *finger username@hostname*; as an example, try this writer's account by entering *finger nrandall@watarts.uwaterloo.ca*.

The information you receive depends on the information made available on the finger server. Usually, this information will include the user's real name, the account directory, when and from what machine the person last logged on, and possibly information such as the user's office number and phone number. Finger servers also allow a user to post text information called a *plan*, which offers whatever details the user wants to make available. Most finger information

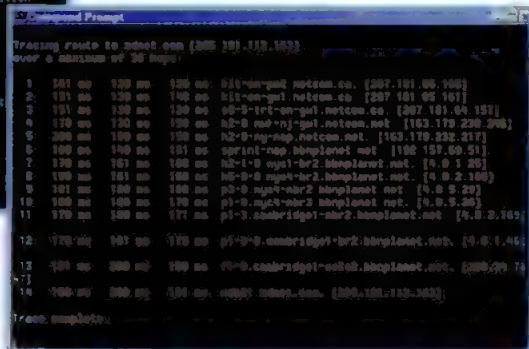


FIGURE 3: The results of a traceroute session display the hops in order from first to last, with each intermediate router shown on a separate line.

is now available on Web pages or through institutional directories, so finger is less used all the time.

Many organizations do not allow finger requests from outside, for reasons of privacy. Either the request will simply time out or you'll receive a notification that the information is unavailable. For the latter of these responses, try fingering the account *president@whitehouse.gov*.

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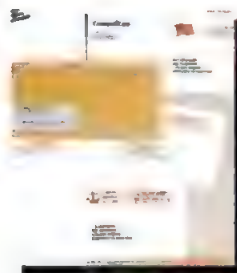
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TRACEROUTE (TRACERT.EXE)

On the Net, packets are routed from machine to machine along the network until they reach their destinations. The function of traceroute is to let you see the path through which packets travel from your machine to the destination machine. This is essentially a network-debugging function, a means of determining where delays are occurring along the path. But even if you're not a network administrator/debugger, the information is interesting, because it shows you a bit about how the Internet functions.

Like ping, traceroute makes use of ICMP's echo function to get response information from a remote computer. The Tracert.exe application operates by sending a succession of groups of packets toward a specific destination—the IP address of the desired destination computer. If you want to trace the route from your machine to `whitehouse.gov`, for example, you will type `tracert whitehouse.gov`. Each router along the path returns information to the origin machine, showing the user the IP address of the machine that received the packets and the round-trip time (in milliseconds) of each packet. When the trace is complete, you will know the number of hops the packets needed to move from origin to destination, as well as the time taken by each hop.



The crucial component of the traceroute operation is the TTL (time to live) values of the packets. Traceroute sends a succession of three-packet groups with increasing TTL values. Along the path, each router decrements the TTL value by 1, then passes it along to the next router. The first group of packets is sent with a TTL of 1; the router at the first hop decrements the value to 0, causing the packet to expire, and sends the expiry information back to the origin machine (ICMP requires this transmission). The second group then goes out with a TTL of 2, with the second router rather than the first returning the expiry information. This continues until either the maximum TTL value is reached or, ideally, the destination computer receives the packet. Windows' Tracert.exe has a default maximum TTL value of 30, which means it can report the first 30 hops; you can increase this value by using the `-h` option (enter `tracert` alone on the command line for the list of options).

Figure 3 shows the result of a Tracert.exe

session, from a dial-up connection through `netcom.ca` to the specified destination, `zdnet.com`. The first hop was received by a machine within the `netcom.ca` network, and the three packets had round-trip times of 161, 120, and 120 milliseconds respectively. The next group of three packets, with an assigned TTL value of 2, were received by machine 207.181.65.161, with different round-trip times. At hop number 6, the packets left the Netcom network to be received by the BBN Planet network, and they stayed within that network until they reached ZDNet's machine at hop number 14.

Windows 95/98/NT certainly doesn't offer the full suite of Internet tools Unix does. Many server types do not ship with Windows, including server software for telnet and POP3/IMAP, nor do diagnostic tools such as Dig and TCPDump. But the available tools are useful, and it's too bad that Microsoft saw fit essentially to bury them without benefit of something like an Internet Tools group accessible via the *Start | Programs* menu. These tools aren't glamorous, but they work. **PC**

Neil Randall is the author of *The Soul of the Internet (ITCP)* and a contributing editor of PC Magazine.



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ENTERPRISE COMPUTING

Complex Needs, Complex Systems

By Keith Pleas

What is an enterprise? While the term is often used in general business situations to describe a corporate entity, anything from a sidewalk espresso cart to an organization as large as General Motors, in the computing world it generally means something large and more specific. Roughly, computing environments can be categorized as follows:

Level	Number of users
Desktop	1
Workgroup	2+
Department	100+
Division	1,000+
Enterprise	10,000+
Internet	100,000+

This isn't to suggest that small businesses aren't worthy of the enterprise appellation, but rather to point out that their needs—and computing environments—can be easily distinguished from those of organizations that are large, complex, and geographically dispersed.

How is an enterprise (in terms of the above metric) different from, for instance, a workgroup or department? After all, it's logical to assume that all organizations have similar computing needs: file storage, backup, network connectivity, some level of security, expandability, and so on. Well, as the

number of machines grows, the ways they are connected, interact, and are managed change as well. It isn't just a function of the number of machines an organization uses: An enterprise computing **infrastructure** also typically involves multiple WAN-connected sites with a variety of operating-system types, network protocols, security needs, and application requirements. These sites—which are often separated in terms of geography, time, and perhaps nationality or even language—must also be planned for and **managed** on both a centralized and a distributed basis. And perhaps the biggest challenge in enterprise computing is building and maintaining enterprise **applications**, which must handle heavy user loads while providing high levels of availability and system and data integrity.

Ironically, many smaller organizations are encountering enterprise issues today as a result of having a presence on the Internet. They are quickly discovering that even a handful of high-end PCs might have a tough time handling the kind of demand generated by 100,000 users making more than a million requests each day. And common networking issues such as latency, throughput, and reliability are getting increasing attention from people who aren't traditional network administrators.

INFRASTRUCTURE

As the Internet has been incorporated into general computing, its infrastructure has become more public as well. Everyone is now at least slightly familiar with the Internet Domain Name System (DNS) and the competition for scarce Internet resources such as names and IP addresses. Companies like Cisco Systems, which makes most of the routing hardware used by the Internet, now have surprisingly high name recognition. And the standards used in the Internet—such as TCP/IP for networking, SMTP and POP3 for messaging, NNTP for news, and the ubiquitous HTTP for Web communications—have also become familiar to almost everyone who works with PCs on a regular basis.

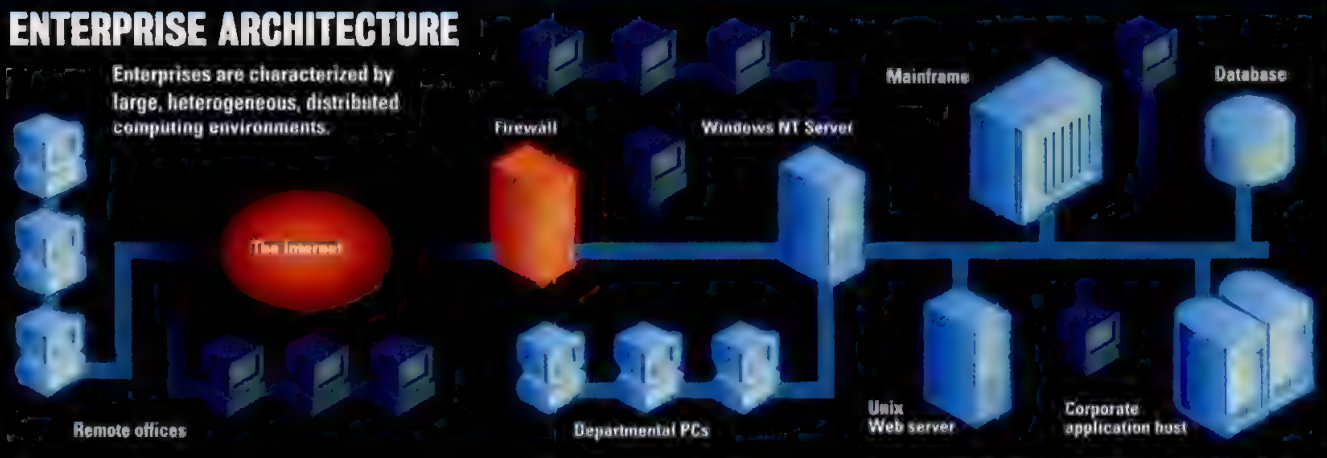
A typical enterprise, however, might involve a multiprotocol broadband network backbone, a legacy mainframe with terminals, Digital VAXes with departmental Oracle databases, NetWare file servers, Windows NT servers running BackOffice applications, Unix-based engineering workstations, and obviously a variety of desktop PC configurations. Smaller organizations might be able to go with the current trend and dictate that everything communicate via TCP/IP. In an enterprise organization, on the other hand, a single network protocol might be possible at the workgroup or department level but completely infeasible for the organization as a whole.

Complicating this situation is the requirement to bridge these enterprise systems and the Internet in order to provide interoperability of systems, ranging from relatively straightforward systems—such as e-mail—to complex business-based systems such as electronic purchasing and online commerce.

Virtual private networks (VPNs) over unsecure public networks are replacing more secure—and more expensive—communica-

ENTERPRISE ARCHITECTURE

Enterprises are characterized by large, heterogeneous, distributed computing environments.



tions methods. While almost everyone appreciates having an easy-to-remember e-mail name that can be used from anywhere in the world, the flip side is that this convenience opens up yet another mechanism that outsiders can use to access your organization's systems.

Key issues: How do you guarantee that every user in the organization can work—and work efficiently—from anywhere, including using e-mail, sharing files, and accessing data? How do you provide the bandwidth and network redundancy necessary to handle current and planned loads? How do you implement a security system that is “cheap” for friends to use but “expensive” for enemies to circumvent?

MANAGEMENT

It's a pretty straightforward task to figure how much your organization is spending on hardware, software licensing and development, training, services, and supplies: Just add up all the purchase orders. More difficult to track are the soft costs—the costs of planning, management, and administration—which are a significant part of the overall total cost of ownership (TCO).

Larger organizations that develop and enforce standard configurations can benefit from an economy of scale. Not only can they reduce costs through volume-purchasing arrangements, but having to manage thousands of machines makes it cost-effective to use automated deployment tools. Staged testing and controlled trial deployments allow an organization to verify a configuration's behavior before adopting it on a wider scale. Log-on/log-off scripts and policy-based security control access to organization-wide resources, such as directories and distributed file systems.

Administration of network server applications also consumes significant resources, but again automation plays an important role in larger organizations. Rather than using fancy graphical interfaces, systems administrators with many servers to control often rely on command line interfaces and scripting tools. Thin-client technologies such as Citrix WinFrame and Microsoft Terminal Server complicate both the client and the server scenarios.

Key issues: How do you ensure that all users use the same (approved) version of an operating system or application? How do you automate the rollout? How can you minimize the number of support calls and, when you have to respond, make it as painless as possible to “fix” a machine's hardware and software configuration? How can you provide a



ENTERPRISE COMPUTING

single log-on to all the organization's resources? How can you control the use of public- and private-key encryption systems to ensure that enterprise assets are protected and recoverable?

APPLICATIONS

One of the largest challenges in application development is providing scalability. While enterprise infrastructures are normally built with and managed by commercially available products and system capacities are predictable, applications—other than for desktop productivity—are normally constructed on a more custom basis. Because of their price/performance advantage, PC-based systems are

While it's possible for a while to throw a bigger machine at the problem, eventually the solution is to spread work across multiple machines.

increasingly being used to handle applications that historically ran on mainframes.

Unfortunately, scaling these systems to service higher loads is often extremely difficult. While it's possible for a while to throw a bigger machine at the problem, eventually the solution involves spreading the work across multiple machines. Moore's Law, about the doubling of computing power every 18 months, offers some solace. But on the other hand, Amdahl's Law (based on observations about data-management housekeeping overhead published by Gene Amdahl over 30 years ago) describes the diminishing returns of parallel processing and the irreducible scalability bottleneck of the sequential part of any program. Even though scaling techniques such as managing request queues and pre-creating pools of required resources are commonly employed, the net result is that you can't count on just throwing more hardware at a problem.

As the distribution of system components increases, so does the number of failure

possibilities. Systems that must provide high availability must also be able to deal with eventual failures, even to the point of being able to cope with disasters such as long-lasting power outages and the loss of entire data sites through natural catastrophes.

The ability to handle transactions, which succeed or fail as a whole, is an integral part of almost every large-scale business system. Clusters of machines are now commonly being used to provide high levels of availability for key applications. Of course, nothing comes for free. As, one well-known adage goes, “You can optimize a system for features, performance, or cost. Pick two.”

Key issues: How do you provide 24-hour, 7-day-a-week access to key corporate data? How do you develop an application quickly enough that it isn't obsolete by the time it's actually deployed? How do you provide users, both inside and outside the organization, with access to your data without severely impacting your production databases? How do you provide a high level of availability for a Web application when it's almost impossible to forecast demand accurately?

CONCLUSION

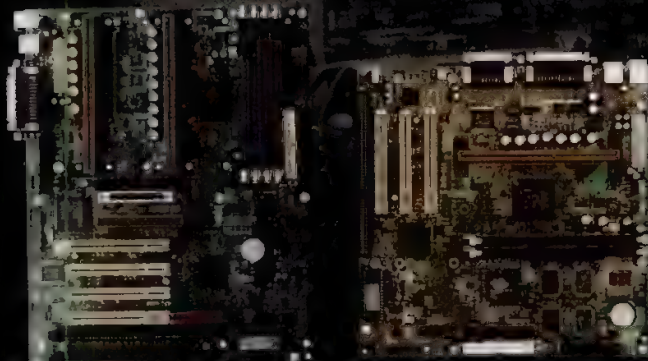
Our new Enterprise Computing column will give you the information necessary to deal with the key issues discussed above. Of course, many systems start at the less-than-enterprise level. Perhaps a departmental policy-and-procedures application gets replicated throughout the enterprise and must quickly scale to 10,000 users. Or a local bank is acquired by a large, national bank, and a trust management system must now be deployed in hundreds of branches. Or a small, start-up Internet-based business suddenly gets widespread attention and must respond to thousands of simultaneous user requests.

Even if you are not currently working at managing, administering, or developing an enterprise system, the issues discussed in this column will help you understand many of the systems that you interact with, both within and outside your work organization. It's no coincidence that as Microsoft has looked beyond the desktop toward becoming a key player in the enterprise environment, the company has added support for important enterprise technologies—such as DNS, transaction management, clustering, thin-client, and messaging services—to the operating system Windows NT 4.0, with many more services announced for the next release. **PC**

Keith Pleas is an independent consultant and a frequent contributor to PC Magazine.

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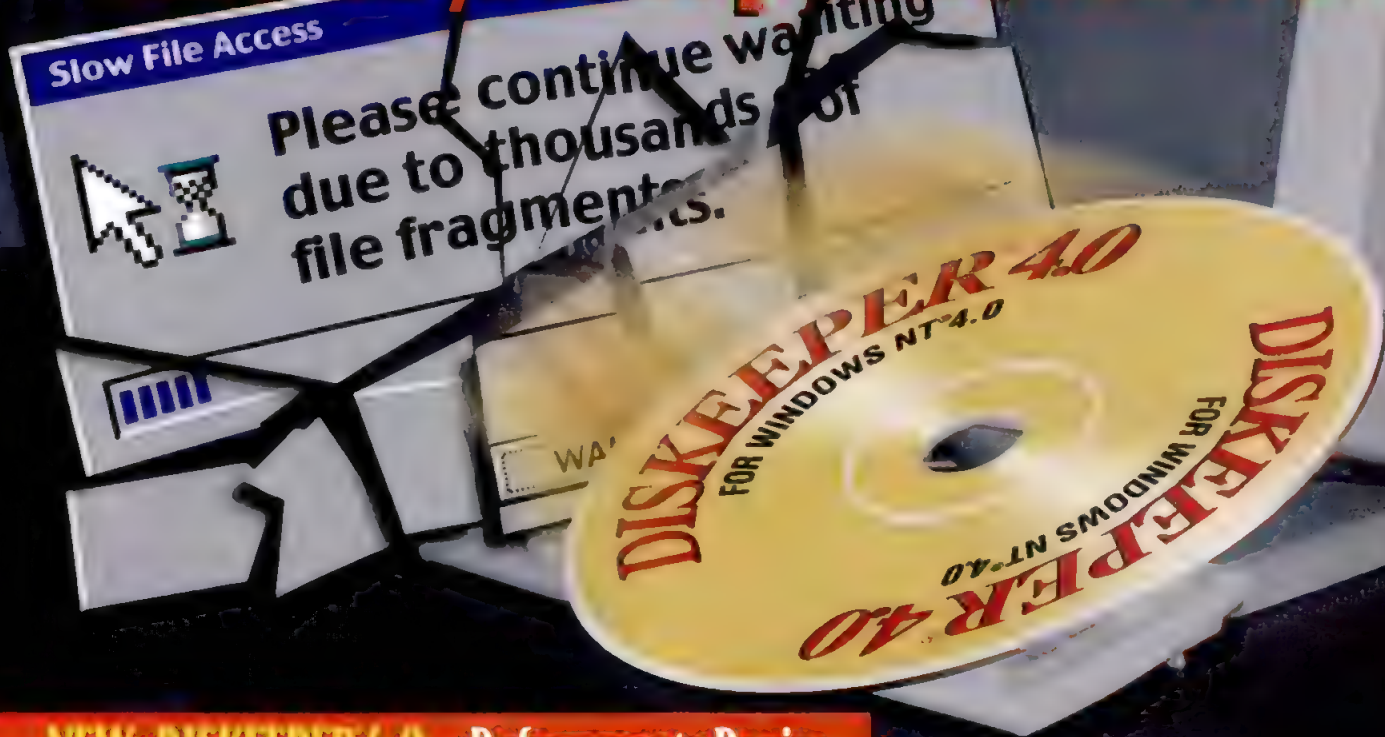
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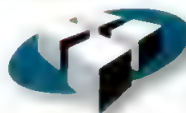
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PC TECH

Palm Computing: So Much from So Little

By Neil Randall

The 3Com Palm III personal digital assistant (PDA) and its older siblings have become increasingly popular since the system was introduced thanks to their simplicity, functionality, and ease of use. How does so small a package accomplish so much?

As with all computing machinery, the Palm relies on an operating system for its functionality. Like a networked PC, which includes both an OS and a means of linking to the network operating system, the Palm includes both the OS (currently Palm OS, Version 3.0) and software that lets the device link with a PC or a Mac.

MEMORY AND DATA STORAGE

Like PCs, Palms operate with both ROM and RAM, and both types are stored on memory modules known as cards; in fact, the single card shipped with each device contains both. The Palm III ships with 2MB of ROM and 2MB of RAM, the PalmPilot Professional has 1MB of each, and earlier models shipped with correspondingly less. The Palm's architecture lets it hold up to 256 cards containing up to 12MB of memory, although the OS can actually address a theoretical limit of 4GB. Clearly, it was designed with the future in mind.

The device's ROM holds the operating system plus the applications that ship with the unit; RAM is used for any applications you install or develop yourself, user data for all applications, and any other user-configurable data. Because the RAM is powered by the Palm's batteries, data is safe when the Palm enters low-power modes (see "Power Modes" below). You will lose data in RAM if the Palm is without power for over a minute, however, so it's important to transfer your data to your PC before losing battery power (as when you change batteries).

The Palm's RAM is divided into dynamic RAM and storage RAM. Dy-

namic RAM holds any applications not in ROM, necessary system data, and the TCP/IP stack, if installed. Storage RAM (analogous to a hard disk on a PC) holds user data and is configured to be nonvolatile. A soft reset, for instance, will clear the dynamic RAM but not the storage RAM; a hard reset, by contrast, will clear both and is thus not recommended.

Palm devices with 512K of memory (the original Pilot and the PalmPilot Personal) have 32K of dynamic RAM, and a 1MB unit contains 64K. The Palm III provides a 96K dynamic area; the remainder is storage RAM. Storage RAM in earlier operating system versions was divided into 64K *heaps* (memory available for use by applications), but the Palm III configures all storage RAM as a single heap. In all versions, data storage in the heap is divided into *chunks* of up to 64K. The data itself is stored in these chunks, which form the basis of ROM as well as RAM storage.

The Palm uses an efficient database model rather than a PC-like file-system model to store data. PC file systems eat up substantial resources, using memory to buffer data in both the read and write procedures and drawing data from secondary memory (such as caches) and

bringing it into primary memory. Moreover, files are accessed from a hard disk, which connects to the CPU through a bus that is always much slower than the CPU's capabilities. The Palm OS, by contrast, uses primary memory only, accessing data directly from memory in 64K chunks and modifying data directly in primary memory without the need to store it elsewhere. The result is speed.

In fact, the Palm OS divides memory into units it calls *databases*. Each database has its own attributes, such as which application created it, and the dates and times of its creation and modification. Integral to the system is the OS's data manager: The data manager sees that all data has a common format and is organized according to the system's common scheme. Each database can also be indexed according to specific features of particular applications, so you can sort data almost instantly once it is displayed in the application. In fact, the actual content of data records is application-dependent, because different applications use data in different ways, but the organization and format of databases is the same throughout. This commonality is extremely important for the simplicity of *HotSync*, the process whereby Palm applications

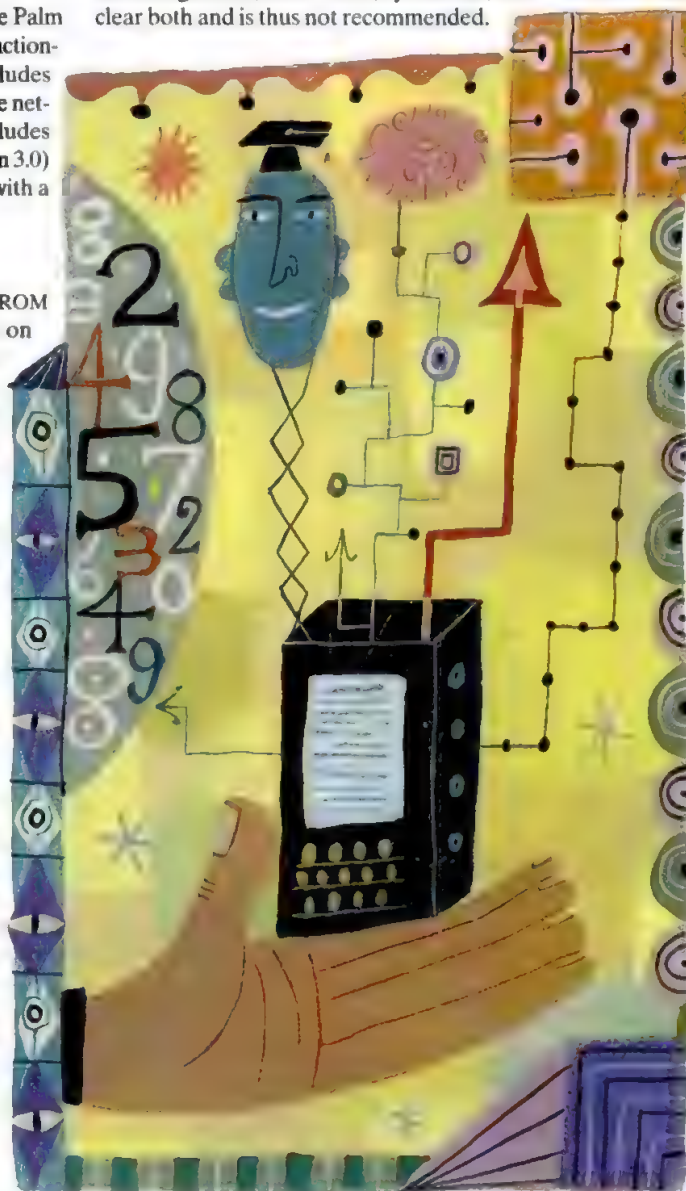


ILLUSTRATION BY CALEF BROWN



synchronize via serial or modem connection to corresponding applications on your PC. HotSync can simply transfer data structures without needing to know anything about data records themselves.

Not only is the application data accessed directly from primary memory, the actual applications are accessed and launched this way. Switching from one application to another is instantaneous, because primary memory simply closes the first and launches the second, with the modified data also stored in primary memory. In other words, data never leaves the nonvolatile primary memory in which it is

stored, so there's no need for an external storage device in which to preserve it. Of course, there's always a chance that the device might malfunction or need resetting, resulting in a loss of data, and this is an important reason for the existence of the HotSync system. The Palm invites you to think of your PC as a big, safe storage space for your precious informa-

tion, not as a big, strong brother to the nice but weak PDA. Regular Palm users tend to make that shift in perception quite quickly.

POWER MODES

Because of the way in which data is stored, and because of the user's need to run a PDA instantly on demand, the power system is crucial. The Palm operates in three different power modes: sleep, idle, and running. In running mode, as you'd expect, the processor is operating, interpreting input, and executing instructions. But as soon as the processor has no further input to handle the Palm slips into idle

Palm Resources

No matter how satisfied you are with the software that ships with your Palm, like most PC users you'll find yourself wanting more. Happily, download sites abound. You'll find a good starting point at www.zdnet.com/swlib/pilotsoftware.

POPULAR SOFTWARE

3Com's Platinum Solutions page (www.palm.com/software/pilsoft.html) gives a good view of the commercial developments in Palm software. Here you'll discover that Corel, Franklin Quest, and Lotus all offer Palm support in their PIM software. Corex Technologies Corp. has a business card scanner for the PC with built-in Palm synchronization. Infinity Softworks gives the Palm financial worksheet software with PCPlus Professional, and Palmata Software's Palmata Mail can synchronize e-mail between the Palm and several popular PC mail clients. Actual Software's MultiMail Pro takes the idea one step further, letting you work with e-mail directly on the Palm (no PC necessary) using a Palm modem. There's much more, including games, translators, reference material, and other utilities and applications.

Palm freeware and shareware offerings are also numerous. ProxiNet offers a Web browser, complete with graphics, support for forms, and page caching. The ISAAC Group's Top Gun Postman works with the Palm's built-in PilotMail to let you download mail from a POP server and upload messages composed on the Palm. Other Internet offerings include the shareware chat client PalmIRC, the freeware news reader NetNews, and the telnet client PalmTelnet. AutoPilot is a freeware package that configures your PC's browser to download pages or data (stock quotes, news items, and so on) and then transfers them to the Palm through HotSync, letting you construct a personalized information base. For more links, check out www.palm.com/resources/shareware.html.

But the Net doesn't dominate Palm software. There are hordes of calculators, including the touted Convert-It for measurement conversions and SynCalc for mathematical calculations. Pilot Task Generator improves on the Palm's built-in to-do software; several packages add functionality to the HotSync feature itself. Mobile Account Manager keeps track of your financial account numbers, passwords, PINs, and other account ID information. TealGlance gives you a one-stop view of your day's information, similar to Outlook Today in Microsoft Outlook 98 for the PC. ThoughtMill and

the commercial BrainForest help you organize your ideas and thoughts into workable outlines. Earthtime, meanwhile, tells you what time it is in any part of the world, which is always handy when you're placing phone calls to distant locations.

One of the more interesting and growing application areas for the Palm is e-text reading. Several sites offer books and articles for download, some for free. Check first in Palm Central's info area (www.palmcentral.com/info.html), The Lending Library (www.macduff.net/library.asp), MemoWare (www.memoware.com), and the PalmPilot Library (www.pilotlibrary.org). In fact, an entire Web ring exists just to cover e-texts for this platform (www.webring.org/cgi-bin/webring?ring=pilot_text/list). The books are typically in the Palm DOC format, which means you'll need a DOC reader (typically available from the e-text sites themselves) to open them.

Perhaps the most surprising part of this phenomenon is that the Palm isn't half bad for reading. You need a good light, but the machine is lighter and smaller than most novels, and you should be able to read comfortably for half an hour or more.

THE PALM ON THE WEB

Not surprisingly, a huge variety of Web sites are dedicated to the Palm. The most obvious starting point is the Web Resources section of Palm's own site (www.palm.com/resources), but the PalmPilot Archives (www.cybercamp.net/~dmbrowne/pilot.htm), with its large lists of annotated links, provides an even better launching pad. From here you can find links for application development, software downloads, user groups, online magazines, and more, all very nicely organized.

Other highly useful sites:

- Palm Planet features software, Q&A, news, opinions, and reviews: palmplanet.interspeed.net/palm/palmplanet.shtml.
- Palmistik includes software, games, travel and entertainment guides, news, and reviews: www.palmistik.com.
- PalmCentral has software (with good information), additional links, and the PalmPilot Web ring (www.palmcentral.com/webring.html), with excellent browsing among Palm sites: www.palmcentral.com.
- PalmPilot World is a good resource site about the Palm and other PDAs. It has reviews, articles, Palm histories, and a very long list of external links: www2.southwind.net/~miked/pilot/pilot.html

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mode (all but indistinguishable from running mode), in which, from the user's perspective, the device is on, the display is available, and the system clock is running. In fact, when the Palm is in idle mode, the processor is unavailable to execute instructions, and the unit draws power once again only when the system detects input from the user. In other words, tap on the display with the stylus, and running mode begins again. But if you're reading a document, for example, the processor shuts down until you scroll to the next page, and this on/off process recurs continually depending on need.

The final power mode, sleep, occurs when the system has been in idle mode for a few minutes. The processor, system clock, and display all shut down. Again, as soon as the Palm detects user input it comes out of sleep mode and goes directly into running mode.

GRAFFITI

Although the Palm provides an on-screen keyboard, the primary means of entering data is through the pen-input interface, known as *Graffiti*, on a small rectangular writing area at the bottom of the Palm's display. The left-hand section of the writing area is for text; the right-hand section is for numbers. Both sections handle punctuation symbols and cursor commands (Return, Caps Lock, Space, and so forth). In brief, a user draws characters representing letters, numbers, and punctuation within this rectangle, and then a display driver reads these pen presses as a series of points and moves the points into a buffer. The OS reads this buffer and translates the points into the appropriate character, displaying it on the screen.

The Graffiti system is controlled by four OS components: the event manager, the pen manager, the Graffiti manager, and the Graffiti recognizer. When the stylus touches the Graffiti display area, the event manager calls the pen manager and informs it of the pixel location (x- and y-coordinates). When the pen moves, the event manager tells the pen manager or application the location of the traversed pixels, including the final coordinate where the pen is lifted off the display, at which point the event manager sends a penUpEvent message to the system.

Pixel information is stored in a buffer called the *pen queue* as unprocessed coordinates; the Graffiti manager is responsible for making sense of them. When the system sees the penUpEvent message, it calls the Graffiti manager function *GrfProcessStroke*, which in turn lets the Graf-

fiti recognizer determine the character represented by the pen stroke. At this point, the character is placed into another buffer called the *key queue*, erased from the pen queue, and displayed (or its required action is performed). For this purpose, *character* refers to letter, number, symbol, or cursor command.

Graffiti works from a user's standpoint, first because the characters closely resemble our alphanumeric symbols (see Figure 1), and second because as soon as the hardware buffer hands

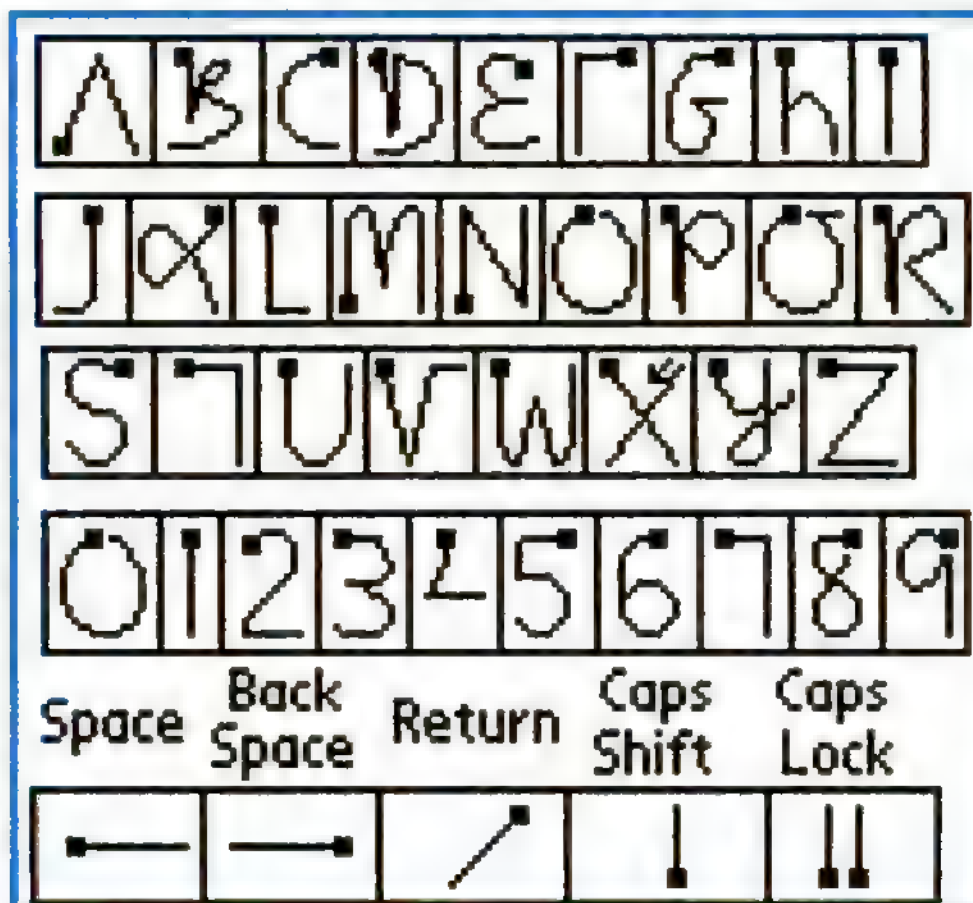


FIGURE 1: Graffiti characters resemble their familiar counterparts, though a few letters such as T, F, and K take a little getting used to. The dot shows where to initiate each character.

the point series off to the system software it is ready to accept another input. This means the user can input pen strokes quickly and is in little danger of "outrunning" the system itself.

HOTSYNC AND CONDUITS

The Palm connects to the PC through a serial cable attached to the Palm's cradle. The cradle provides a connector which the Palm slides into and a button for initiating the HotSync procedure. HotSync's primary purpose is to ensure that data in the PC's Palm Desktop matches data on the PDA, but it also installs new applications or documents onto the Palm.

When HotSync manager is running on the PC, the PC monitors the serial port. When the HotSync button is pushed, the PC and the Palm perform a short handshake, and the PC takes over. During HotSync, the Palm operates as the server and the PC as the client; all the re-

quests and transfers are initiated by the PC.

Whenever you change a data record on the Palm, the OS's data manager flags the header of that record as *modified*. At HotSync time, the PC searches the Palm's record headers for these flags and requests that the Palm transfer that particular record. Because individual data chunks are so small, the synchronization takes very little time. Time is also conserved through the use of record ID numbers: Each record has a unique ID, and once transferred that same record has an identical ID on the PC. The PC can thus search for specific IDs to determine if it needs to transfer a new record or delete an existing one. In the case of a deletion, the data itself is erased from the Palm's memory storage, but the record ID remains with a *delete* flag appended.

During the next HotSync, the PC sees the flag and deletes the record with the same ID from its hard disk.

Constantly adding new data will eventually fill the Palm's memory, so the OS offers an archiving system. Archived records (specified by the user or automatically by an application) are flagged as such in the record header. The PC locates these records during HotSync, requests their transfer to an archive area on the PC's hard disk, and then requests the deletion of that record from the Palm. Finally, the PC deletes the record from the Palm Desktop, retaining it in the archive.

The PC synchronizes data through *conduits*, DLL files that ensure that the correct actions are performed on the right databases. Palm apps and their PC equivalents share a unique conduit, designed to work specifically on data for one program. On HotSync initiation, the PC looks in the Win-

dows registry under HKEY_CURRENT_USER\Software\U.S. Robotics\Pilot Desktop and loads all the conduits into memory in succession. The conduit itself provides instructions for synchronization. It typically ensures the exact mirroring of databases in corresponding apps, but conduits can perform other functions as well. The Install Tool on the Palm Desktop, for instance, calls a conduit that transfers an application file to the PDA and adds a corresponding icon to the applications display.

As you can see, the Palm OS ensures that this little PDA manages data properly. It allows fast, easy, and usable input, and it synchronizes efficiently with desktop software running on the PC. No wonder the device has won the hearts and minds of so many. **PC**

Neil Randall is a contributing editor of PC Magazine.



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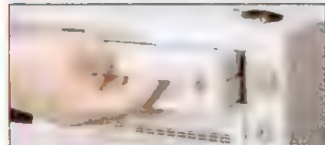
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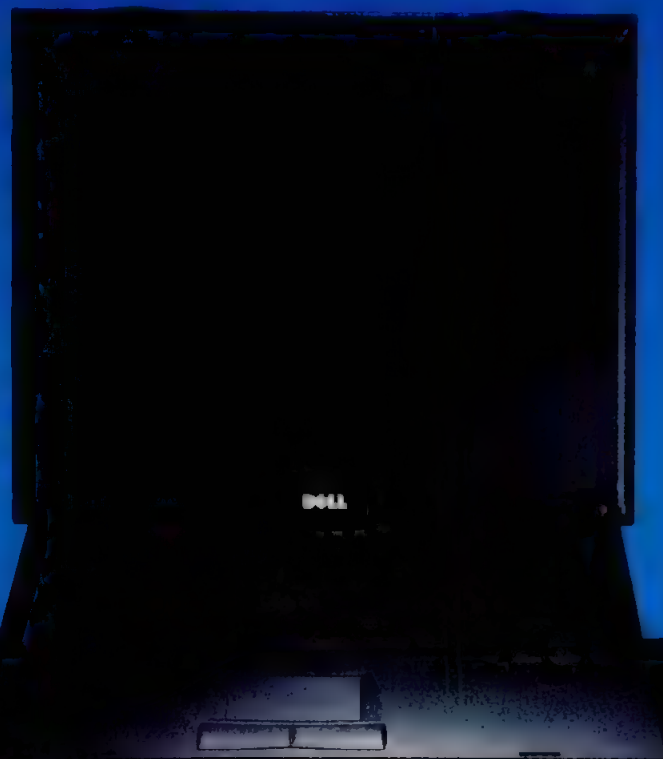
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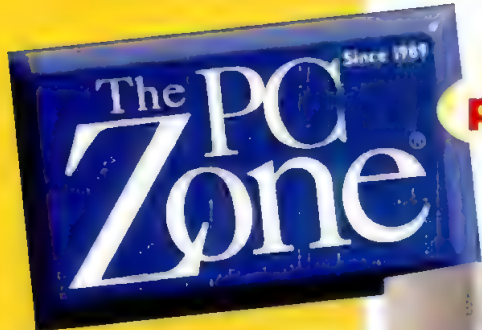
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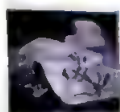
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770X P2-300 64/8 1 DVD	#57173	\$4,799
14.1 TFT 56K		
770X P2-300 128/8 1 DVD	#57171	\$5,199
13.7 TFT 56K		

Toshiba

Satellite

4000CDS P2-233MHz 32MB/4.1GB HD, 24X CD, 56K Flex Card, 12.1" SVGA DSTN	#08832	\$1,529
4000COT P2-233MHz 32MB/4.1GB HD, 24X CD, 56K Flex Card, 12.1" SVGA TFT	#54323	\$1,749
4010COT P2-266MHz 32MB/4.1GB HD, 24X CD, 56K Flex Card, 12.1" SVGA TFT	#84636	\$1,909
4020COT P2-300MHz 64MB/6.4GB HD, 24X CD, 56K Flex Card, 12.1" SVGA TFT	#84685	\$2,899

Portege Series

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Portege 3010CT MMX266 32/4 3 56K 10.4 TFT	#100243	\$1,919

Tecra Series

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56K 13.3XGA TFT		
Tecra 8000 P2-300 64/8 1 24CD	#86548	\$3,599
56K 14.1XGA TFT		

Compaq

Armada

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Armada 1700 P2-233 32/3.2 24CD 12.1 TFT W95	#28635	\$2,264
Armada 1700 P2-266 32/4 0 24CD 13.3 56K	#8062	\$2,987
Armada 1700 P2-300 32/5 0 56K 14.1 TFT	#74894	\$3,739

Armada 7400 Series

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Armada 7400 P2-300 64/6 4 24CD 13.3CFT	#74899	\$3,867
Armada 7400 P2-300 64/6 4 24CD 13.3CFT	#74734	\$4,059
Armada 7400 P2-300 64/6 4 24CD 13.3 NT	#74735	\$4,059

Armada 7800 Series

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Presario 1200 Series

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Presario 1240 MMX266 64/4 0 24CD 12.1	#74853	\$1,799*
Presario 1250 K6-300 64/6.4 24CD 12.1	#74858	\$2,199*

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Presario 1900 Series

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Hewlett-Packard

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Umax

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#34783	8000	PII233MMX	32	4GB	24X	12.1" TFT	56K	\$2,749
#34787	8000T	PII266MMX	64	6GB	24X	13.3" TFT	56K	\$3,449
#34976	7800CDM	PII266MMX	64	5.1GB	20X	13.3" TFT	56K	\$2,899
#34976	7800DVD	PII233MMX	64	5.1GB DVD	13.3" TFT	56K		\$3,049
Portege 7000 Series								
#34810	7000CT	PII266MMX	32	4.3GB	—	12.1" TFT	56K	\$2,929
Satellite Series								
#34755	4000CDS	PII233MMX	64	4.1GB	24X	12.1" DSTN	56K	\$1,649
#34756	4000CDT	PII233MMX	64	4.1GB	24X	12.1" TFT	56K	\$1,849
#37283	4010CDS	PII266MMX	32	4.1GB	24X	12.1" DSTN	56K	\$1,949
#37284	4010CDT	PII266MMX	32	4.1GB	24X	12.1" TFT	56K	\$2,249
#37281	4020CDT	PII300MMX	64	4.4GB	24X	13.3" TFT	56K	\$2,399

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#35180	TP380Z	PII300MMX	32	4.6GB	24X	12.1" HPA	—	\$2,599
#35181	TP380Z	PII300MMX	32	4.6GB	24X	12.1" HPA	—	\$2,789
ThinkPad 560								
#35329	TP560X	PII233MMX	32	4GB	—	12.1" TFT	56K	\$2,499
#35338	TP560X	PII300MMX	64	4.6GB	—	12.1" TFT	56K	\$3,369
#35343	TP560X	PII300MMX	64	4.6GB	—	12.1" TFT	56K	\$3,469
NEW IBM® x600								
#30322	TP600	PII233MMX	32	3.2GB	10-24X	13.3" TFT	56K	\$3,329
#30323	TP600	PII266MMX	32	4.0GB	10-24X	13.3" TFT	56K	\$3,799
#33432	TP600	PII 266MHz	32	3.2GB	24X	12.1" TFT	56K	\$3,049
#35187	TP600	PII266MMX	64	5.1GB	24X	13.3" TFT	56K	\$4,139
#35193	TP600	PII266MMX	64	6.0GB DVD	13.3" TFT	56K		\$4,399
IBM® x600								
#30325	TP700E	PII266MMX	32	5.1GB	—	14.1" TFT	33.6K	\$3,469
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#36036	E335	PII233MMX	32	3.2GB	24X	13.3" TFT	56K	W95 \$2,199
#36038	E340	PII266MMX	32	4.0GB	24X	13.3" TFT	56K	W95 \$2,599
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#26706	1920MT	233MHz MMX	32	3.1GB	20X	12.1" TFT	56K	\$1,979
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#33230	1700	PII 233MHz MMX	32	4.0GB	24X	12.1" TFT	56K	\$2,299
#33235	1700	PII 266MHz MMX	32	4.0GB	24X	13.3" TFT	56K	\$2,799
#35391	1700	PII 300MHz MMX	32	5.0GB	24X	14.1" TFT	56K	\$3,499
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#31073	7800	PII 266MHz MMX	64	5.0GB	20X	13.3" TFT	—	\$3,599
Armada 3500 Series								
#35380	3500	PII 266MHz MMX	32	4.1GB	—	12.1" TFT	—	\$2,799
#35381	3500	PII 300MHz MMX	64	6.4GB	—	13.3" TFT	—	\$3,699
Armada 6500 Series								
#35483	6500	PII 300MHz MMX	64	6.4GB	24X	14.1" TFT	56K	\$4,149
#35465	6500	PII 300MHz MMX	64	6.4GB	24X	14.1" TFT	56K	\$4,249

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#32556	1650	PII 266MHz	64	4.0GB	24X	12.1" TFT	56K	\$2,599
#32563	1655	PII 266MHz	64	4.0GB	24X	13.3" TFT	56K	\$2,599
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#36296	PII 350MHz MMX	64	4.3GB	—	TD	Win 95	\$1,309
#36314	PII 400MHz MMX	64	10.0GB	32X	TD	Win 95	\$1,789
#36315	PII 450MHz MMX	64	10.0GB	32X	TD	Win 95	\$1,919
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Order#	Pentium® Processor	RAM	HD	CD	Form Factor	System	Price
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#36286	Celeron 300MHz	32	3.2GB	32X	MT	Win 95	\$1,249
#36288	Celeron 333MHz	32	3.2GB	—	DT	Win 95	\$1,189
#36289	Celeron 333MHz	32	6.4GB	32X	MT	Win 95	\$1,339
#36282	PII 400MHz MMX	32	6.4GB	—	DT	Win 95	\$1,569

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#36607	628513U	Celeron 300	32MB	3.2GB	—	\$1,209
#36590	627557U	PII350	32MB	3.2GB	—	\$1,309
#36612	627557U	PII350	64MB	6.4GB	32X	\$2,599
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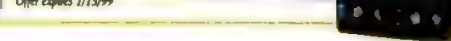
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102357	350PIII/64MB/4.3GB	1129
102358	350PIII/64MB/10.0GB/32X	1449
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102360	450PIII/64MB/10.0GB/32X	1899

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102285	333Celeron/32MB/3.2GB/10/100	1159
102344	333Celeron/32MB/3.2GB/32X	1079
102291	350PIII/64MB/10.0GB/10/100/WinNT	1749
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102294	400PIII/64MB/10.0GB/10/100/WinNT	1949
102348	450PIII/64MB/9.1GB/32X/WinNT	2599

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102346	333Celeron/32MB/6.4GB/32X	1379
102286	333Celeron/32MB/3.2GB/32X/10/100	1479
102296	450PIII/64MB/6.4GB/32X/10/100/WinNT	1869
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102227	333Celeron/32MB/4.3GB/32X/56K	1049
104051	400PIII/64MB/8.0GB/32X	1599
101971	350PIII/32MB/8.0GB/32X	1199
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103836	400PIII/32MB/3.2GB	1369
104041	400PIII/64MB/6.4GB/32X	1589
103841	450PIII/64MB/6.4GB/32X/10/100	1909

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100966	350PIII/64MB/4.3GB/32X	1499
100968	400PIII/64MB/6.4GB/32X	1799
58873	400PIII/64MB/10.1GB/32X/10/100	1829
103132	400PIII/64MB/10.1GB/32X/10/100	2099
104768	450PIII/64MB/10.1GB/DVD/10/100	2179



IBM PC 300 GL Desktop

59583	350PIII/64MB/3.2GB	\$1319
59582	400PIII/64MB/3.2GB	1589

IBM PC 300 GL Minitower

59680	333PIII/32MB/3.2GB	\$1058
59584	350PIII/64MB/6.4GB/32X	1559
59585	400PIII/64MB/6.4GB/32X	1899

IBM PC 300PL Desktop

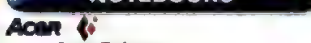
54001	350PIII/64MB/6.4GB	\$1759
54002	400PIII/64MB/6.4GB	1879

IBM PC 300PL Minitower

54006	350PIII/64MB/4.2GB	\$1899
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54607	400PIII/64MB/6.4GB	1999
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NOTEBOOKS



Acer Extensa

105516	266MMX/32MB/3.2GB/20X/56K/12.1" DS	\$1279
103764	266MMX/32MB/4.1GB/20X/56K/12.1" TFT	1599
57896	233PII/32MB/4.1GB/24X/56K/13.3" TFT	2149

COMPAQ

Compaq Armada 1700 Series

103055	233PII/32MB/3.2GB/24X/56K/12.1" HPA	\$1999
58895	233PII/32MB/4.0GB/24X/56K/12.1" TFT	2299
103064	300PII/32MB/5.0GB/24X/56K/14.1" TFT	3400

Compaq Armada 3500 Series

103057	266PII/32MB/4.1GB/12.1" TFT	\$2699
103058	300PII/64MB/6.4GB/13.3" TFT	3599

Compaq Armada 7000 Series

102985	300PII/64MB/6.4GB/24X/13.3" TFT	\$3895
102989	300PII/64MB/6.4GB/24X/33.6GB/13.3" TFT	4095
55276	266PII/64MB/5.0GB/20X/13.3" TFT	3599
102995	300PII/64MB/8.0GB/DVD/33.6GB/14.1" TFT	4599

Compaq Presario

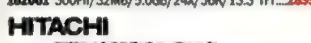
102462	266MMX/32MB/4.0GB/24X/56K/12.1" HPA	\$1699*
102463	266MMX/64MB/4.0GB/24X/56K/12.1" TFT	1999*
102464	300PII/64MB/6.4GB/24X/56K/12.1" TFT	2399*
58296	266PII/64MB/4.0GB/24X/56K/13.3" TFT	2799
101785	300PII/64MB/6.4GB/DVD/56K/13.3" TFT	3499*

*After mkt. rebate.



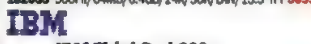
Fujitsu Lifebook

102051	233PII/32MB/3.2GB/20X/56K/12.1" HPA	\$1299
102054	266PII/32MB/4.0GB/20X/56K/13.3" HPA	1599
102055	233PII/32MB/3.2GB/24X/56K/12.1" TFT	1799
102056	233PII/32MB/3.2GB/24X/56K/13.3" TFT	2199
102059	266PII/32MB/4.0GB/24X/56K/13.3" TFT	2599
102061	300PII/32MB/5.0GB/24X/56K/13.3" TFT	2899



Hitachi VisionBook

58078	233PII/32MB/3.2GB/24X/56K/12.1" TFT	\$1799
102035	266PII/32MB/4GB/24X/56K/12.1" TFT	2099
100119	266PII/64MB/4GB/24X/56K/12.1" TFT	2799
102033	300PII/64MB/6.4GB/24X/56K/13.3" TFT	3099



IBM ThinkPad 380

101585	233PII/32MB/4GB/24X/13.3" TFT	\$2158
103388	233PII/32MB/4GB/13.3" TFT	2278
101586	300PII/32MB/4GB/24X/13.3" TFT	2598

IBM ThinkPad 390

104279	233MMX/32MB/3.2GB/56K/12.1" TFT	\$1699
104280	233PII/32MB/3.2GB/56K/12.1" TFT	1899
104283	266PII/64MB/4.3GB/56K/14.1" TFT	2799

IBM ThinkPad 560

101593	233PII/32MB/4GB/56K/12.1" TFT	\$2458
101594	300PII/64MB/6.4GB/56K/12.1" TFT	3258
101595	300PII/64MB/6.4GB/56K/12.1" TFT	3398

IBM ThinkPad 600

100860	233PII/32MB/3.2GB/24X/56K/12.1" TFT	\$2729
54590	266PII/32MB/4GB/24X/56K/13.3" TFT	3399
101589	300PII/64MB/5.1GB/24X/56K/13.3" TFT	3959
101590	300PII/64MB/5.1GB/OPE	4059

IBM ThinkPad 770

101581	300PII/128MB/8.1GB/56K/14.1" TFT	\$4996
54587	266PII/64MB/8.1GB/56K/14.1" TFT	4498
101584	300PII/64MB/8.1GB/56K/DVD/14.1" TFT	4698
101582	300PII/128MB/8.1GB/24X/56K/WinNT/14.1" TFT	4998



Sharp Actius UltraLite

59797	233MMX/64MB/3.2GB/56K/11.3" TFT/3lbs.	\$1999
103002	266MMX/64MB/4.3GB/56K/11.3" TFT/3lbs.	2299



Toshiba Satellite

101103	233PII/32MB/4.1GB/24X/56K/2.1" DS	\$1499
101104	233PII/32MB/4.1GB/24X/56K/12.1" TFT	1800

103394	266PII/32MB/4.1GB/24X/56K/12.1" DS	\$1599
103398	266PII/32MB/4.1GB/24X/56K/12.1" TFT	1899
103448	300PII/64MB/6.4GB/24X/56K/13.3" TFT	2799

HANDHELD PCs



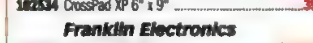
39153	PalmPilot Professional Edition 1MB	\$229.95
54184	Palm III 2MB, Backlit, Infrared Port	349.95



51093	Pager Watch (Ridge Face)	\$99
57121	Pager Watch (Five Point Face)	99



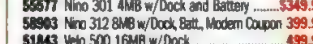
104002	Cassiopea E-11	\$385
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58627	C-Series 2015c	\$699
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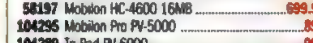
52245	CrossPad ultra 850 mini	\$349.95
102534	CrossPad XP 6" x 9"	399



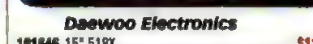
101581	REX Pro 5 for Laptops	\$189.95
101582	REX Pro 5-OS for Desktops	289.95



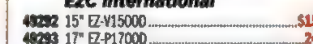
49958	620XL Color Palmtop PC	\$899
59973	660XL Color Palmtop PC	899



55577	Nino 301 4MB w/Dock and Battery	\$349.95*
58903	Nino 312 8MB w/Dock, Batt., Modern Coupon	399.95
51843	Welo 500 16MB w/Dock	499.95*
51844	Welo 500 24MB w/Dock	599.95*



42282	Series 5 Palmtop 8MB	\$449.95
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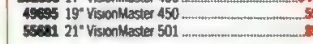


40406	Mobion HC-4500	\$649.95
58197	Mobion HC-4600 16MB	699.95
104295	Mobion Pro PV-5000	899
104289	Tri-Pad PV-6000	999

MONITORS



101846	15" 518K	\$119
103044	17" 7108	199



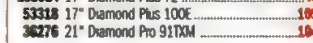
49292	15" E2-V15000	\$159
49293	17" E2-P17000	249



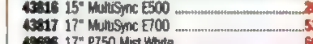
43320	19" Elite 751	\$659
39904	21" SuperScan Pro 800	\$899



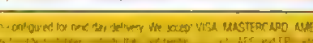
58514	16" Flat Panel LCD TFT (White)	\$1799
58520	16" Flat Panel LCD TFT (Black)	1799



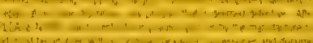
102655	17" VisionMaster 400	\$449
49959	19" VisionMaster 450	599
56881	21" VisionMaster 501	899



101805	14" VS-40	\$129
46331	15" VS-5	149
46332	17" VS-7	229



38304	15" D1530	\$180
32600	17" D1700	309
32605	17" DX700T Technitron	329



100625	NEW! 19" Diamond Scan 90E	\$689
103084	17" Diamond Plus 72	499
53318	17" Diamond Plus 100E	1099
36276	21" Diamond Pro 917DM	1849





Xerox

104005 DocuPrint C55 Color Laser	\$1799*
60445 DocuPrint N24 Laser	2399
104056 DocuPrint C55AMP Color Laser	2499*
48289 DocuPrint N32 Laser	2799
60441 DocuPrint N40 Laser	3499

*Special pricing while supplies last.

SCANNERS

Fujitsu

52843 ScanPartner 600C SCSI Flatbed w/ADF	\$1399
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Hewlett-Packard

101191 ScanJet 4100 Cse	\$199
49509 ScanJet 5100 Cse	299
191053 ScanJet 6200 Cse	399

IBM

104608 IdeaScan	129*
104656 Flatbed Color	149.95*

Memorex

54836 SCF 6120P Flatbed	99.95
54837 SCF 9360P 3D Flatbed	79.95

Microtek

104196 SimScan C3 USB	\$49.95*
57799 ScanMaker N6EL	229.95*
101546 ScanMaker 4	699

Minita

40612 Dimage Scan Dual Film Scanner	\$699
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Nikon

59077 Super CoolScan 2000	\$1799
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Polaroid

31234 SprintScan 35 Plus	\$1399
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UMAX

101653 Astra 1220U	\$129*
54475 Astra 1220S Cross-Platform	149*
40005 Aelia 1200EX	179*
51167 PowerLook II Duo/Photoshop LE	899*

Visioneer

102589 PaperPort One-Touch 5300	599
102590 PaperPort 6100B	119*
40455 PaperPort Strobe Pro	149.99*
53944 PaperPort OneTouch Flatbed	169*

*After mfr's mail-in rebate.

DIGITAL CAMERAS

Canon

57727 PowerShot A5 Digital Camera	\$699
57435 ZR MiniDV Camcorder	995
101674 Vixia MiniDV Camcorder	1495
57434 Optura MiniDV Digital Camcorder	1795

Kodak

56087 DC220	\$699
56086 DC260	899

Nikon

104285 Coolpix 900s	\$749
55074 Coolpix 600	379

Olympus

55672 D-340L	\$499
104248 D-400 Zoom	799
47234 D-600L	899
104249 D-620L	1199

SONY

103306 NEW! Mavica FD81	\$799
105337 NEW! Mavica FD91	999
59952 Mavica FD51	499
59053 Mavica FD71	699

Toshiba

190907 PDR M1	\$595
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PROJECTORS

Epson

63877 PowerLite 5000XB LCD Projector	\$4099
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InFocus

101433 LP425 LCD Projector	\$4199
101445 LP735 LCD Projector	6899

Polaroid

52058 Polaview 211E LCD Projector	\$3499
49917 Polaview 215 LCD Projector	3199

INPUT DEVICES

Adesso

54449 Eagle Touch Keyboard PS/2	\$12.95
54451 Powermouse Ergonomic PS/2	14.95
30217 Nu-Form Split-Key Keyboard PC	29.95
30219 Nu-Form Split-Key Keyboard w/TouchPad PC	44.95
21345 TruForm Extended Keyboard PC	44.95

Belkin

104777 WebRacer Internet Controller	\$69.95
58006 USB 3 Button Mouse	19.95
58004 USB 104 Key Keyboard	39.95
40333 USB Express Hub	100.95

Cross Pen

52244 iPen Pro	\$134.95
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Good Systems Inc.

101526 TelevisorT3 Pro PC TV Converter	\$329.95
35455 Optical Laser PS/2 Mouse	29.95

Kensington Technology Corp.

25008 Expert Mouse	\$99.95
57085 Mouse in a Box Scroll PC	24.95
30535 Orbit Trackball PC	49.95

Keytron Corporation

39590 104 Keyboard PS/2	\$24.95
40987 Keytronic Classic Keyboard	29.95
57099 Lifetime Mouse PS/2	39.95

Logitech Inc.

102951 Cordless Desktop Keyboard and Mouse	\$99.95
49720 Trackman Marble FX	79.95
54277 Trackman Marble Plus	59.95
45944 MouseMan+	49.95
45943 First Mouse PS/2	16.95

Marlow Data Systems

32761 105 Keyboard	\$29.95
21457 2-Button Ergonomic Serial Mouse	14.95
21458 2-Button Trackball	24.95

Wacom

101872 Intuos GMS	\$289.95
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MULTIMEDIA

Creative Labs

100196 Sound Blaster LIVE!	\$195.95
100142 Sound Blaster 128 plus 4-Pc. Speakers	149.95
53742 Blaster 32X CD-ROM Drive	69.95
53743 Blaster DVD-ROM Drive	99.95*
45690 PC-DVD Encore Dr2	159.95*
53368 3D Blaster VooDoo2 12MB PCI	189.95*

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DATA STORAGE

Hewlett Packard

100153 SureStore 8110i CD-Writer Plus External	\$399
101297 CD-R Media 50-Pack	89.95
105040 8GB Colorado Internal Tape Drive w/Tape	259
105042 8GB Colorado External Tape Drive w/Tape	299
105032 24GB SureStore Dat 24i DDS-3 Internal	1099

Imaging

102641 Zip Drive Parallel External	\$119.95
102640 Zip Drive SCSI External	119.95
46089 Zip Drive SCSI Internal w/Zip Zoom	119.95
46090 Zip Drive ATAPI Insider	99.95
47105 Zip Plus	169.95
103333 Zip Disk 10-Pack (Gray)	99.95
106303 Jaz Drive 1GB SCSI External (Refurbished)	199.95
23616 Jaz 1GB SCSI External	299.95
102878 Jaz 2GB SCSI External	349.95
24202 Jaz 1GB Disk Single	99.95
32556 Jaz 2GB Disk 3-Pack	269.95
47079 Jaz 2GB Disk 3-Pack	299.95

Kodak

101649 CDR Media 30	\$89.95
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Memorex

52498 CDR 74min 10-Pack w/320 Mail-in Rebate	\$27.95
10020 CDR 74min 100-Pack	149.95
48599 CD-RW Disc 5-Pack w/5 FREE CD-R Discs	49.95

Meridian Data

102404 8GB Snap! Server	\$949.95
102405 16GB Snap! Server	1699.95

Quantum

48043 DLT IV 35/70GB Tape Cartridge	\$84.95
58561 5.1GB Fireball EX Ultra DMA HD	159
58069 4.3GB Fireball SE Ultra SCSI HD	289
58068 6.4GB Fireball SE Ultra SCSI HD	309
58067 8.4GB Fireball SE Ultra SCSI HD	409

Seagate

49529 2.1GB Medalist IDE HD	\$115
40139 3.2GB Medalist IDE HD	119
51478 4.3GB Medalist Ultra ATA HD	139
51475 6.5GB Medalist Ultra ATA HD	169
50294 8GB TapeStor Int. SCSI Travan Tape Drive	219
54435 9.1GB Medalist Pro Ultra ATA HD	239
54431 9.1GB Barracuda 9LP SCSI	539
55063 9.1GB Cheetah Ultra2 LVD HD	719
55018 18.2GB Barracuda Ultra Wide SCSI HD	999
56524 4.5GB Cheetah Ultra2 LVD HD	1299

Smart and Friendly

53407 4x12 CD Speedwriter SCSI Internal	\$399
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Western Digital

53408 4x12 CD Speedwriter SCSI External	499
50101 4x24x CD-RW 426 SCSI External	599
42537 5.1GB Caviar Retail-Packaged HD	149.95*
45919 6.4GB Caviar Retail-Packaged HD	189.95*
55097 8.4GB Caviar Retail-Packaged HD	199.95*
101327 10.1GB Caviar Retail-Packaged HD	249.95*

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Yamaha

102841 4x16x16 CRW4416S Internal SCSI	\$419.95
102844 4x16x16 CRW4416S External SCSI	\$499

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American Power Conversion

10539 Back-UPS 280 (180 Watts)	\$59.95
56170 Back-UPS Pro 650 (410W)	279.95
56167 Back-UPS 500 (330W)	149.95
21929 Back-UPS Pro 1000 (670W)	389.95
56164 Back-UPS 300 (180W)	99.95
56165 Back-UPS Office 280	84.95
56169 Back-UPS Pro 420 (260W)	229.95
31468 Smart-UPS 700 Net (450W)	369.95
31469 Smart-UPS 1400 Net (950W)	639.95
31470 Smart-UPS 2200 Net (1600W)/PowerChute+	999.95

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101381 280ES (280W)	99
101383 420ES (420W)	149

Tripp Lite

101100 Super 6 + Tel	\$359.95
21831 Super 7 Surge Suppressor	17.95
6786 Isobar 4 Ultra	44.95
8630 Isobar 6 Ultra	54.95
13147 Isotel 6 Ultra	64.95
100694 Internet Office 400	89.95
21044 BC Pro 1400 UPS (940 Watts)	419.95
45091 SmartPro 1400 NET UPS	494.95

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52953 3Com/USR Winmodem Internal	\$49.95*
55204 Fast Ethernet XL with Winkler 5-pack	389.95
53751 SuperStack II Switch 3300 24-Port	2369
51639 SuperStack II Dual Speed Hub 500 24-Port	949

*After \$30 rebate.

Asante Technology

38297 10BaseT FriendlyNet 8-Port Hub	\$54.95
100063 FriendlyNet 10/100 8-Port Switch	379.95

Bay Networks

100960 Baystack 450 switch 24-Port	\$2299
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Belkin

37711 OmniView KVM 2-Port	\$189.95
32066 OmniView KVM 6-Port	279.95

Cisco

52027 Catalyst 2924XL 24-Port Switch	\$1899
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DLink

53371 Dual Speed 10/100BTX SOHO 4-Port Hub	\$89.95
53384 Dual Speed 10/100BaseTX 8-Port Hub	219.95
53385 Dual Speed 10/100BTX Stackable 8-Port Hub	349.95
53373 DFE-916X 10/100BaseTX 16-Port Hub	639.95

HP Networking

29682 Jet Direct EX Plus Print Server Ethernet LANs	\$229.95
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Intel

45634 PRO/100+ PCI Adapter 5-pack	\$339.95
103647 Create & Share Camera w/Software & Burny Doll	109.95*
104535 Netport Express 3-Port Print Server	299.95*

*Mail-in rebate in rebate. **After \$20 rebate.

Linksys

59287 10/100BaseTX PCMCIA PC Card; 16-bit	\$74.95
60032 10/100BaseTX PCMCIA PC Card; 32-bit	79.95
59632 10/100BaseTX Etherfast 5-Port Hub	69.95
59650 10/100BaseTX 24-Port Auto-sensing Hub	429.95
59629 10/100BaseTX PCI EtherFast LAN Card	29.95
59200 10/100BaseTX 8-Port Auto-Sensing Hub	149.95

Netgear

35404 FA310TX 10/100BTX Fast Ethernet PCI Adapt.	\$28.95
47800 RT328 ISDN Router	269.95
53560 DS108 10/100BaseTX 8-Port Hub	219.95
53562 DS516 1/100BaseTX 16-Port Stackable Hub	599.95
48222 FS508 Fast Ethernet Switch 8-Port	619.95

Kirtom

55424 RealPort 56K Modem & 10/100BTX Enet Adapt.	\$319.99
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SOFTWARE

Adobe Systems

10078 Adobe Illustrator 8 Upgrade	\$119.95
100160 Adobe Illustrator 8	359.95
54074 Adobe Photoshop 5.0 Version Upgrade	189.95
54075 Adobe Photoshop 5.0	599.95
43823 Adobe Acrobat 3.0.1	189.95

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32847 Adobe PageMaker 6.5	\$119.95
32845 Adobe PageMaker 6.5	549.95
55128 Adobe Premiere 5 Version Upgrade	189.95
55127 Adobe Premiere 5	589.95
102923 Adobe Graphic Studio	829.95

AutoDesk

104099 AutoSketch 6	\$94.95
103628 AutoCAD LT 98	399.95

Computer Associates

103229 ARCserveIT 6.6 Workgroup Ed. for Win NT	\$399.95
103234 Inoculate! 4.5 Workgroup Ed. for WinNT	399.95
103257 ARCserveIT 6.6 Workgroup Ed. w/ProPack	449.95

Corel

57535 Corel PrintOffice	\$69.95
49973 Corel Photo-Paint 8 Upgrade	94.95
55722 WordPerfect Suite 8 w/Dragon Nat. Speak Upg.	94.95
53682 Corel Ventura 8 Upgrade	194.95
55721 WordPerfect Suite 8 w/Dragon Nat. Speaking	329.95
40615 CorelDRAW 8 Upgrade	239.95
40619 CorelDRAW 8	439.95

Dragon

100242 Dragon Naturally Speaking Preferred	\$189.95
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Network Management		

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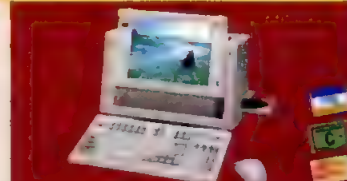
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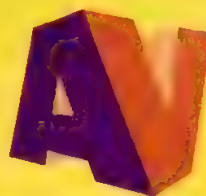


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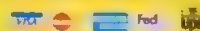


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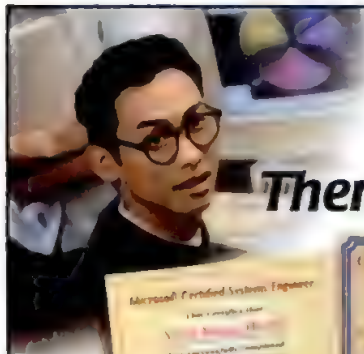
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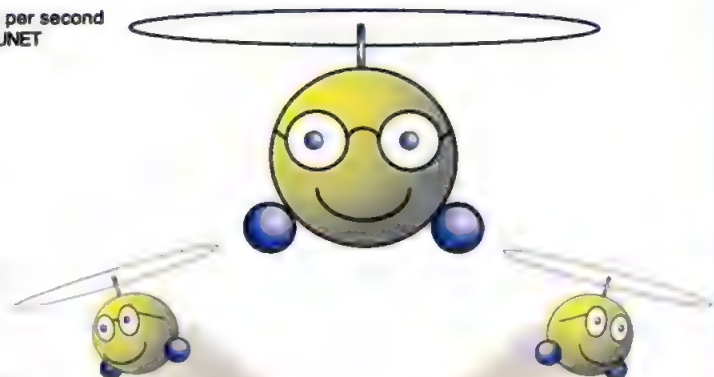
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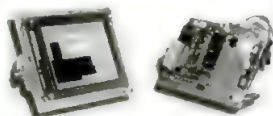
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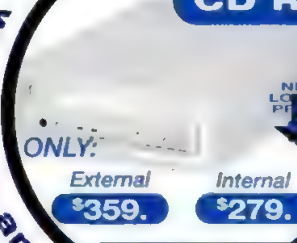


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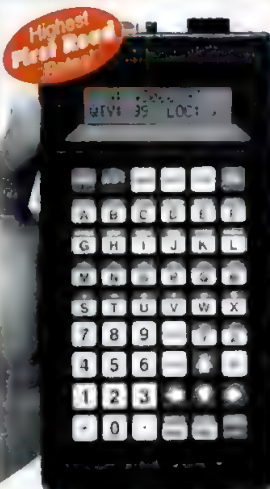
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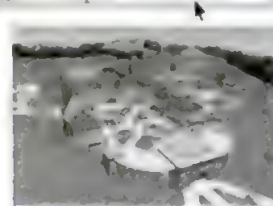
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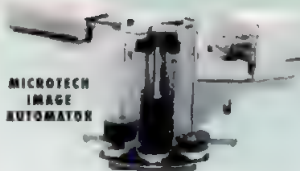
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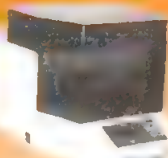
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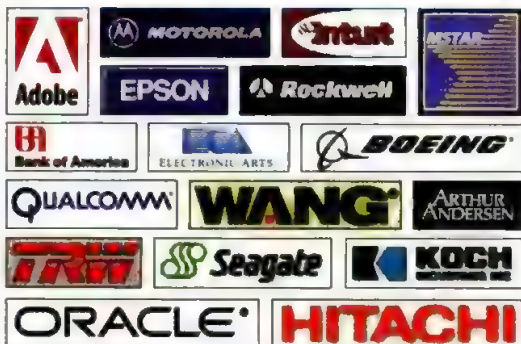
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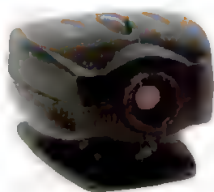
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AFTERHOURS

THE HOME SIDE OF COMPUTING



TOYS AND GADGETS

PC Playthings

By Karen J. Bannan
and Jennifer Triverio

Educators and parents alike have discovered a correlation between children and computers: Kids who spend time on a PC at an early age seem to have an advantage over their peers. But life shouldn't be all work and no play. Though we agree that using the PC as a learning tool is a wonderful idea, using it just for fun is as well.

From Barbie to Buzz Lightyear to Winnie the Pooh, your children's favorites have made the transition from doll, movie

screen, book, or stuffed animal to the realm of PC hardware. In this roundup, we take a look at mice, a drawing tablet, a digital camera, and an interactive bear, all of which are kid-friendly and will help your youngsters get comfortable with computers as they play.

Delta Millennium Computer Accessories

Barbie, Hot Wheels, the Little Mermaid, Mulan, and Snoopy. Are they popular in your household? Delta Millennium is hoping so, as the company debuts its line of computer accessories fea-

turing mice, mouse pads, and disks. Ranging in price from \$9.99 to \$59.99 (list), the accessories are sold alone or packaged together in kits.

So what are you getting when you invest in one or more of these PC add-ons? The \$9.99 mouse pads are fun, and they've got a hard PVC coating that's resistant to little ones' spills and mishaps. There are two designs for each line, including Ariel

from *The Little Mermaid* and Simba from *The Lion King*.

With a mouse pad, you've got to have a mouse. Delta Millennium offers two types of mice: traditionally shaped and 3-D molded. The traditional ones (\$29.99, or \$34.99 with mouse pad) are painted with the likeness of favorite characters: a bright blue mouse with the likeness of one of the pups from *101 Dalmatians*, for example.

The \$34.99 3-D molded mice are eye-catching but disappointing: We loved the concept and the look of mice shaped like Buzz Lightyear, Mickey Mouse, or Winnie the Pooh, but using them was a different story. Buzz's helmet and Pooh's eyebrows serve as the mouse buttons, which are awkward and difficult for little hands (or big hands) to manipulate. The Mickey Mouse was the best of the bunch, but it was still not up to par.

The computer kits (\$29.99 to \$59.99) bundle screen savers, disks and labels, and a mouse and mouse pad. Though there's a lot to choose from, we recommend you stick with the painted mice and mouse pads.

kidBoard Pablo

Named after revered artist Pablo Picasso, the kidBoard Pablo will help nurture the budding artist within your child.

The Pablo's drawing tablet is designed with older children in mind, but kids as young as 4 or 5 will enjoy it as well.

The Pablo fea-

FIRST AND TEN

Football fans, take note: Though you won't be able to watch the games on your TV for too much longer, you can still play football on your PC. We review four of the newest releases and take a look at fantasy football on the PC. *Page 314.*



PHOTOGRAPH BY THOMAS CONNOR

AFTER HOURS

tures a 6- by 8-inch drawing area and a pressure-sensitive pen that draws lines thicker and darker as more pressure is applied. The tablet connects to your PC's serial port and has a 1,280-line-per-inch resolution and 128 levels of pressure sensitivity so users can work on a large range of projects. The Pablo is designed for free-hand drawing, image and photo editing, and photo retouching. Like its little brother, the SketchBoard—a tablet designed for young children (\$100 street), which includes Disney's Magic Artist software—the Pablo has a tracing overlay that lets you copy any photograph or drawing.

Setup was a breeze, although we did have to go to the company's Web page to download new Microsoft Windows drivers.

Using the tablet was simple, and drawing was much easier than with a mouse. Because the Pablo's pen functions like any traditional writing source, we found that the small learning curve allowed our testers to jump right into the action and to be much more creative. In addition, frustration levels remained low, a nice change from mouse or trackball drawing.

The drawing tablet ships with two programs, Meta-Creations' Art Dabbler and Kai's Power GOOSE. Each of these art programs is easy to set up and use and provides a wonderful outlet for kids' creativity.

Mattel Barbie Photo Designer Digital Camera & CD-ROM

Mattel Media was formed to blur the lines between toys and computers. One of its newest releases, the Mattel Barbie Photo Designer Digital Camera & CD-ROM, puts a unique, kid-oriented spin on the popular digital camera.

The Barbie Photo Designer ships with an attractive, "Barbie-pink" digital camera, Designer software, and cables. The camera can be used attached to the PC or

untethered; however, because the camera's memory can store only six pictures at a time, the shutterbug will want to keep it connect-

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ed to the PC for continual downloading. The real fun comes once the pictures are transferred into the Designer program, which has four different options to play with.

We like the Fun Effects photo-manipulation software, which lets kids add textures and enhancements to photos. The software tools are as good as those in many "adult" standalone programs. Once children have augmented their photos, they can print them, transfer them to other editing programs, or send them via e-mail to Grandma.

The Digital Flip Book program, which lets children create minimovies, and the Scrap Book program, a virtual photo album that kids can customize and save, are also fun. Testers were less impressed with the World of Barbie feature, which inserts photos into backgrounds and situations featuring Barbie herself.

The camera-and-CD combo requires a Pentium/90 or better with 16MB of RAM and a video card capable of 16-bit graphics; the camera uses a single 9-volt battery. Although the Barbie Photo Designer's photo quality is about what you'd expect from a \$70 digital camera, kids as young as 5 will have a blast with Barbie.



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Mattel My Interactive Pooh

My Interactive Pooh is no silly old bear. This totally interactive yet soft and fuzzy iteration of the classic Winnie the Pooh teddy bear is one smart cookie.

Pooh is designed for children ages 2 and up and can be used in conjunction with your PC or as a standalone toy. Both modes require you to download information, however—such as your child's name, favorite color, and birthday—using the included software.

Pooh comes with a connector (for the download) that attaches



to your PC's parallel port and to a small jack underneath his shirt. Once you've installed the software and downloaded the information, Pooh's ready for playtime.

This adorable bear can talk to children and interact with his surprisingly robust companion software. When kids squeeze his hands or feet, he talks and his head and mouth move, which delighted our 3-, 7-, and 10-year-old testers. Pooh can remember children's names and ages or prompt them for answers, giving them an added incentive to learn.

If you elect to use Pooh with your PC, you'll be able to hear more than 100 stories and 30 songs that are catchy and fun. Pooh also comes with three games, but they were too easy for our older testers. When Pooh leaves the confines of the computer room, kids can still play with him and listen to whichever stories or songs you've downloaded. A full download took us about 12 minutes.

Pooh requires four C batteries for the doll and a single 9-volt battery for the transmitter.

If you grew up with Winnie the Pooh, you're sure to enjoy My Interactive Pooh just as much as your children will.

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TOUCHDOWNS AND TACKLES

Gridiron Glory

By Michael E. Ryan

As the year draws to an end, so does another football season. But thanks to this year's impressive crop of PC games, you can keep the action going long after the final whistle blows in Super Bowl XXXIII. In this roundup, we review four recently released football titles: Madden NFL 99, NCAA Football 99, NFL Blitz, and NFL GameDay '99. (We also preview two Sierra Sports titles that weren't available for testing at press time.)

Though Madden NFL 99 and NFL GameDay '99 are straightforward pro football simulations, the other two titles are a bit different. NCAA Football 99 is a college football game, while NFL Blitz is a no-rules arcade-style take on pro football. We prefer Madden NFL 99 to the other titles reviewed here, but all four games are strong.

Those unfamiliar with football simulations will be awed by the depth and realism of these games. From fingertip catches to all-out quarterback blitzes, all the pros' moves are re-created on the PC. In addition, com-

plex offensive and defensive strategies are played out. And if you're an old fan of this gaming genre, you'll be excited to know that the games have gotten even better this year.



So no matter what you're looking for in a virtual gridiron, we're sure that one of these games will suit your tastes.

Madden NFL 99



The big boy of PC football games is back and better than ever. Featuring intense game play and a spectacular 3-D graphics engine, Madden NFL 99 is clear-

ly the cream of this year's football crop.

Madden NFL requires a Pentium/166 with 16MB of RAM and a Direct3D-compat-



MADDEN NFL 99
★★★★★ \$40 street
Electronic Arts,
800-451-4525,
www.easports.com

ible 3-D accelerator (or a Pentium/200 without a 3-D card). The

game is at its best, however, with a Pentium II processor, at least 64MB of RAM, and a 3Dfx Voodoo or Voodoo2 3-D accelerator.

Game modes include exhibition, season, custom season (in which you can realign the divisions), franchise (in which you guide a team through multiple seasons), tournament, fantasy draft, and practice.

With the exception of NFL Blitz, Madden NFL offers the best game play of the bunch.

You can grasp the controls fairly easily, but if they prove too complex, you can play the game using a one-button mode. Using this feature, you can perform every task in the game—hiking the ball, passing, tackling, and so on—by hitting one button on your game controller.

The game's graphics are simply phenomenal, with incredible detail in the players' bodies and their movements on the field. Also, Madden NFL includes more player animations than the other games reviewed in this roundup, so that players performing such actions as shoestring catches and wrap tackles actual-

ly look the part.

Like NFL GameDay '99, Madden NFL offers full-action Internet play, though it tends to be pretty choppy unless both players have exceptional dial-up connections.

There is very little to dislike about Madden NFL 99. The game offers full-featured football action with great game play and outstanding action. This season, it is clearly the title to beat.

NCAA Football 99

While last year's PC pro football titles were almost uniformly disappointing, NCAA Football 98,

Create Your Fantasy League with Fantasy Sports Pro

Have you ever wanted to set up your own fantasy football league—or any other type of fantasy league, for that matter? Then get your hands on a copy of Sierra Sports' Fantasy Sports Pro (\$29.95 list; Sierra Sports, 800-757-7707, www.sierrasports.com).

This comprehensive software package includes utilities for setting up and running a fantasy league for baseball, basketball, football, or hockey. Fantasy Sports Pro actually incorporates four titles in one: Terry Bradshaw Fantasy Football '98, Mike Richter Fantasy Hockey '98/'99, Grant Hill Fantasy Basketball '98/'99 (ideal because basketball may very well be just a fantasy this season), and Cal Ripken, Jr. Fantasy Baseball '99.

Fantasy Sports Pro gives you complete control over your league, from tasks such as initial team drafts and game scheduling to weekly statistics processing (though that requires signing

up for a pay subscription service). You can even send e-mail, publish a league newsletter, and post information to the Web using this software.

This program really gets into the nitty-gritty of managing your team. There are 55 statistical categories, and you have the ability to generate more than 35 different types of scoring reports. There are numerous drafting methods, and the program easily keeps track of all trades, roster moves, and injured reserve

designations. In addition to tracking all scheduled games, the program keeps tabs on the division-weighted head-to-toe scheduling.

Simply put, Fantasy Sports Pro is the Swiss Army knife of fantasy sports. It offers a tool for just about every league management job.



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from EA Sports, was a pleasant surprise. The game didn't look like much at first glance, but players came to appreciate the excellent game play, the smooth (if not very high-resolution) graphics, and the game's uncanny ability to re-create the college football atmosphere. With NCAA Football 99, EA Sports has improved on the original in almost every way.

The game requires only a Pentium/166 with 16MB of RAM, and it runs fairly well on that configuration. NCAA Football also provides a feature seldom seen in PC games: the ability to run almost completely off of the CD-ROM (with only a 5MB installation on the hard disk). The game supports 3-D acceleration, but only through cards using the 3Dfx Voodoo or Voodoo2 chip set.

In addition to last year's exhibition, practice, and tournament game play modes, NCAA Football also provides a dynasty mode, which lets you guide a college football program through several consecutive seasons, recruiting new players as your older ones

graduate. You can even lose your job if you don't eventually put together a winning program. Best of all, the game includes all 112 Division I-A college teams and stadiums, the

NCAA FOOTBALL 99
★★★★★ \$40 street.
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major conferences, and the bowl games (as well as most of the schools' fight songs). The program even lets you participate in the newly inaugurated Bowl Championship Series, with the FedEx Orange Bowl, the Nokia

Sugar Bowl, the Rose Bowl, and the Tostitos Fiesta Bowl.

When you decide to take a break from playing with the 1998 rosters, you can replay any of the 80 greatest college games of all time.

Game play is very much like Madden NFL 99's, though perhaps even a bit easier to grasp. If you spend enough time with this game, however, it will become too easy; there are a few plays in the game that will garner big yardage far too often.

Still, NCAA Football is a lot of fun. For fans who prefer college football over pro, this is definitely a must-have title.

NFL Blitz

Looking for an uncomplicated quick fix of hard-hitting football action? NFL Blitz is the game for you. The PC version of a coin-operated favorite, NFL Blitz does away with those



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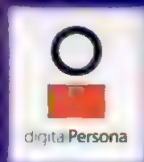
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pesky football rules and modifies a few other elements of the sport to deliver a fast-paced, no-holds-barred style of game play.

NFL Blitz requires either a Pentium/166 with 32MB of RAM and a 3Dfx Voodoo or Voodoo2 3-D accelerator or a Pentium

II/233 with 32MB of RAM and a non-3Dfx Direct3D-compatible 3-D accelerator. The game looks best with the 3Dfx configuration but is still impressive running on one of the other major 3-D chip sets.

Game play is frenetic but rather straightforward. You have two basic options: season play and free play. Season play is not your typical 16-game campaign followed by the play-offs. Rather, it is a struggle to beat increasingly challenging opponents, who are grouped into tiers according to difficulty level. For example, you have to beat the Colts, the Bears, and the Falcons before moving on to the Seahawks, the Patriots, and eventually the Packers and the Broncos.

There are no rules at all dur-

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ing a game. In fact, late hits are not only legal but encouraged (and a lot of fun). Instead of 10 yards for a first down, you need 30 in NFL Blitz. Also, you have only 10 seconds to call each play and only 7 players on the field instead of 11. The result? A remarkably enjoyable brand of football. You can share the experience with a friend; two gamers can play on one PC.

A Peek at NFL Football Pro 99

With a new name and a new look, Sierra Sports' NFL Football Pro 99 aims to regain its place atop the football-simulation market. Football Pro (\$29.95 list; Sierra Sports, 800-757-7707, www.sierrasports.com) is a completely retooled version of a longtime favorite, FrontPage Sports: Football Pro. The new game, which should be shipping by the time you read this, will feature 3-D polygonal graphics, a more intuitive interface, and the same top-notch statistical realism for which the series is known.



NFL Football Pro 99 will utilize up-to-date (September 5, 1998) rosters of all the NFL teams—including rookies. The program will allow for multiseason, multiplayer career play with the rookie draft.

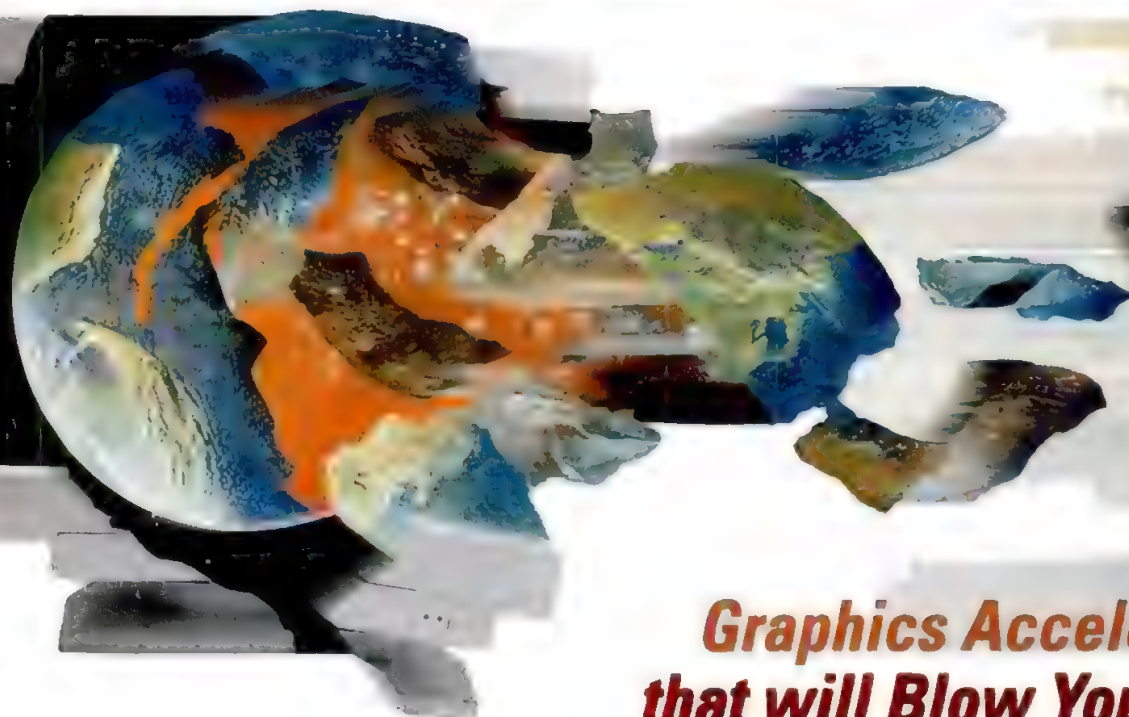
You can really get into the game by playing as an owner, general manager, or coach—in addition to taking the field.

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All tests in FPS. All cards run with vertical sync off. All cards tested on an Intel dual Xeon with 256MB RAM running Windows 95 with DirectX. All names may be trademarks or registered trademarks of their respective owners. The ELSA logo is a trademark of ELSA Inc. Subject to change without notice. ©1998 ELSA Inc.



AFTER HOURS

This game is, quite obviously, not for the football sim purist, though there are 18 offensive setups and 9 defensive ones. The ear-crunching sound effects and brash background music propel you into the game.

If NFL Blitz has a weakness, it is that the game relies on an unwieldy console-style interface. Had the tedious front end been modified for the PC, NFL Blitz would be nearly perfect. As it stands, it's still one of the best sports games around.

NFL GameDay '99

NFL GameDay '99 is the inaugural PC edition of a Sony PlayStation favorite. The game brings a lot to the table in its PC form, including a solid 3-D graphics engine, hard-hitting game play, and full-action Internet play. GameDay '99 can be quite difficult for novice players, however, and it just doesn't match up well

against Madden NFL 99.

GameDay '99 requires a Direct3D-compatible 3-D graphics accelerator, as well as a Pentium/166 with 32MB of RAM. To see the game at its best, you'll want a Pentium II processor,



64MB of RAM, and a 3Dfx Voodoo2-based 3-D accelerator.

You can play GameDay '99 in one of three modes: exhibition, season, or play-off. The game includes four difficulty levels and three game play styles (simulation, total control, and arcade). Even on the easiest difficulty level and the simplest style setting, however, this game can be very tough.



Controlling your team on the field is not terribly difficult, but dealing with the merciless artificial intelligence is. Even while playing as the Packers or the Broncos, we were regularly

thumped by computer-controlled teams—even the Colts and the Bears.

The 3-D graphics and player animations are very good, but not quite up to the standards set by Madden NFL. In fact, the only area in which GameDay '99 outshines Madden NFL is Internet play. Unlike the typical sports game, which offers only coaching-mode play over the Internet, GameDay '99 offers full arcade-action play over your IP connection. The game even provides an elegant matchmaking service through 989 Studios' Web site, where you can meet up with other arm-chair quarterbacks and proceed to take the field.

NFL GameDay '99 is a solid game, but even with Internet play, it is a few steps behind Madden NFL 99 on most counts. **PC**

Coming Up

What's in the Next Issue of *PC Magazine*

Consumer Graphics

Consumer imaging software is becoming increasingly popular. We'll look at 15 consumer image editors and a variety of cataloging programs.

Web Downloads

What are the Internet's hottest free downloads? We'll list the best software programs on the Web and look at eight of the most popular download sites.

Print Servers

Print servers flexibly link printers to networks. We'll review 11 print servers and discuss the future of printing across the Internet with IPP (Internet Printing Protocol).

Digital Cameras

The current crop of entry-level digital cameras take image quality and ease of use to new heights. PC Magazine Labs will test 20 cameras priced from \$300 to \$1,200.

Encyclopedias

1999 brings new versions of six popular encyclopedias. From Grolier to Microsoft Encarta, we'll have them covered.



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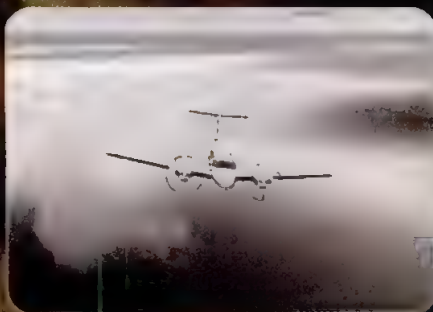
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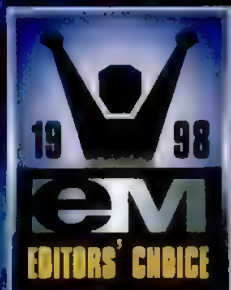
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abort, retry, fail?

THE LIGHTER SIDE OF
PERSONAL COMPUTING

By Don Willmott

Buy and Hold

What do men want? Seth Warchavsky, notorious CEO of the Internet Entertainment Group, which specializes in the marketing of "adult content," assumed that the answer was sex and money. He launched Sexquotes.com, a Web service that combined a real-time stock ticker with dirty pictures of women. Pamela Anderson Lee, whose purloined honeymoon video was marketed at Warchavsky's site, was unavailable for comment.



Our First Hoax

Teenage virgins Mike and Diane promised to deflower each other live online for all the world to see. Soon, two problems surfaced: Mike and Diane weren't who they said they were, and they weren't virgins either. Actors Ty Taylor and Michelle Parma, both fully clothed, admitted the deception at a hastily called news conference.



The Lady Is a Vamp



Proving once again that sex sells, 38-year-old CrossWorlds Software CEO Katrina Garnett launched an ad campaign for her company featuring little more than a Richard Avedon photo of herself in a little black dress. She described herself as "younger than Bill Gates, older than Michael Dell," sat back, and waited for the phone to ring. And it did.

Cute Convicts

The Tennessee Department of Correction invited kids to draw their impressions of prison life for its Web site. One charming scene, which depicted a death-row inmate receiving a lethal injection, was posted briefly but soon removed from the site.



Here's Pie in Your Eye

Now we know what they do for fun in Belgium. Noel Godin, a self-proclaimed pie-throwing anarchist, creamed Microsoft CEO Bill Gates in Brussels. Gates, left sticky but uninjured, declined to press charges. In an interview with *The Netly News*, Godin proclaimed, "Our war cry was explicit: 'Let's pie! Let's pie the polluting lolly!'"

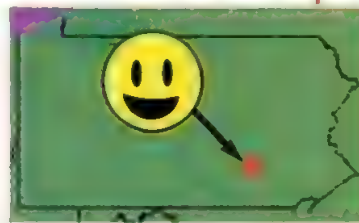


Peripheral of the Year

ABCNews.com reported: "There's a little company in Columbia, Pennsylvania, that will soon unveil a 'revolutionary' tool. It's a plastic and rubber 'peripheral' device that fits onto a man's, ahem, you-know-what. Attached is a cord that plugs into a PC's parallel port. At porn Web sites, a

person can work another tool that relays 'feeling' through the Net to the guy wearing the device.

[Designer Eric] White says it works like a charm. Only problem is, as with everything else with the Web, there's a



slight lag time. White says the company considered building a similar device for women, but market research showed there wasn't enough demand."

Good-Bye!

Columbia University cyber-sex predator Oliver Jovanovic was convicted for kidnapping and sexual abuse. Everyone, even the prosecution team, was surprised by the decision, but the *New York Post* was ready with the headline of the year.



Crash...and Burn?



At Bill Gates's Spring Comdex keynote address, a product manager showing off the merits of the USB protocol crashed a Windows 98 demo. Has this product manager been seen since? Just asking....

• Quote of the Year: "IP on everything."—MCI VP and father of the Internet Vinton Cerf •

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